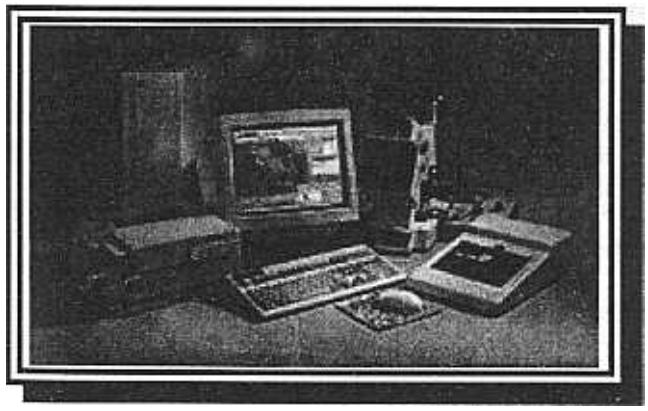
BUEHLER

OMNIMET ENTERPRISE



Declaration of Conformity

Manufacturer: **BUEHLER, Ltd.**
Of: **41 Waukegan Road**
Lake Bluff, Illinois 60044

Declares the following product: ***OMNIMET ENTERPRISE***

To be in accordance with EC Directive(s);

Safety of Machinery:

89/392/EEC and 91/368/EEC and 93/44/EEC according to the following standards:

EN 292 PART 1 1991
EN 292 PART 2 1991
EN 60204 PART 1 1993

EMC Directive:

89/336/EEC and 92/231/EEC according to the following standards:

EN 50081-1: 1992
EN 50082-1: 1992

Position: Director of Engineering

Name: *Chuck Motley*

Signature: Chuck Motley

Date: *1/1/98*

THIS MANUAL IS A CUSTOM GENERATED DOCUMENT. IT INCLUDES ALL REVISIONS RELATIVE TO THIS SPECIFIC BUEHLER ITEM AS OF THE DATE SHOWN BELOW.

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INSTRUCTIONS

BUEHLER®

OMNIMET® ENTERPRISE (861000)

QUANTITATIVE IMAGE ANALYZER FOR MATERIALS SCIENCE APPLICATIONS

Overview of System Functionality

The Buehler® Omnimet® Enterprise is the latest evolution of the Omnimet Image Analysis family.

With Buehler's vast experience in the preparation and microstructural analysis of materials in general, we have over many years, been able to launch Omnimet products that surpass our users expectations, the Omnimet Enterprise is no exception to this.

The Omnimet Enterprise, like all true image analysis systems allows for the 'Quantitative Analysis' of the sample image, rather than the technician having to make a subjective 'Qualitative' assessment. In order to be able to accomplish this, the image from the sample must exhibit sufficient contrast between the features to be measured and the background. It should also be realized that, like any other image analyzer, the Enterprise can only provide spatial measurements of the image, it cannot of itself provide identification of the phases or compounds present.

Quantitative image analysis then, is the quantification of the features within the sample image, and these features are identified by the contrast difference they have to their surroundings. Mostly, this contrast difference can be seen as a difference in gray level in a monochrome image, it may also be seen as a difference in the hue and intensity of a color in the color image. The Omnimet Enterprise in its standard form, works with the grayscale of an image by digitizing it into 256 levels (8 bit) between the video levels 0 (black) and 255 (white). Monochrome is usually sufficient for most metallurgical applications. For applications where color is used to identify one feature as being different to another, such as in Petrography, then Omnimet Enterprise Version 2.0 and higher gives this capability.

The Omnimet Enterprise is a modular system and in addition to color analysis there is also 'High Resolution capability', which, with the supplied digital camera, allows the capture and analysis of images up to 1600x1200 pixels in size.

In its basic standard form, the Omnimet Enterprise comprises a medium resolution monochrome video camera, specially configured high specification PC with image capture card, Windows 98 operating system, Microsoft Office 2000, Buehler proprietary imaging software, connecting cables and instructions. In this form, the system, when linked to a suitable image source, will be able to run analysis routines on correctly prepared specimens that exhibit the necessary optical contrast.

Main Features of the Omnimet Enterprise:

32 bit Windows applications – works in Windows 98

Will accept up to four video cameras inputs in composite video

Video inputs are easily configured and calibrated

Extremely easy to use software, rich in easily understood Icons

Simple menu choices to construct application routines that can be saved for repeated use

Simple image capture, import / export and printing

Integrated image database and report writer (Microsoft Office 2000 included)

Easily add a high resolution camera

Easily add a color camera for true color analysis

Stage and focus automation packages for most microscopes available

Prints data to most commercially available inkjet or laser printers that are Windows 98 supported

Prints images to most commercially available dye sublimation printers (Video printers) that are Windows 98 compatible.

Warranty

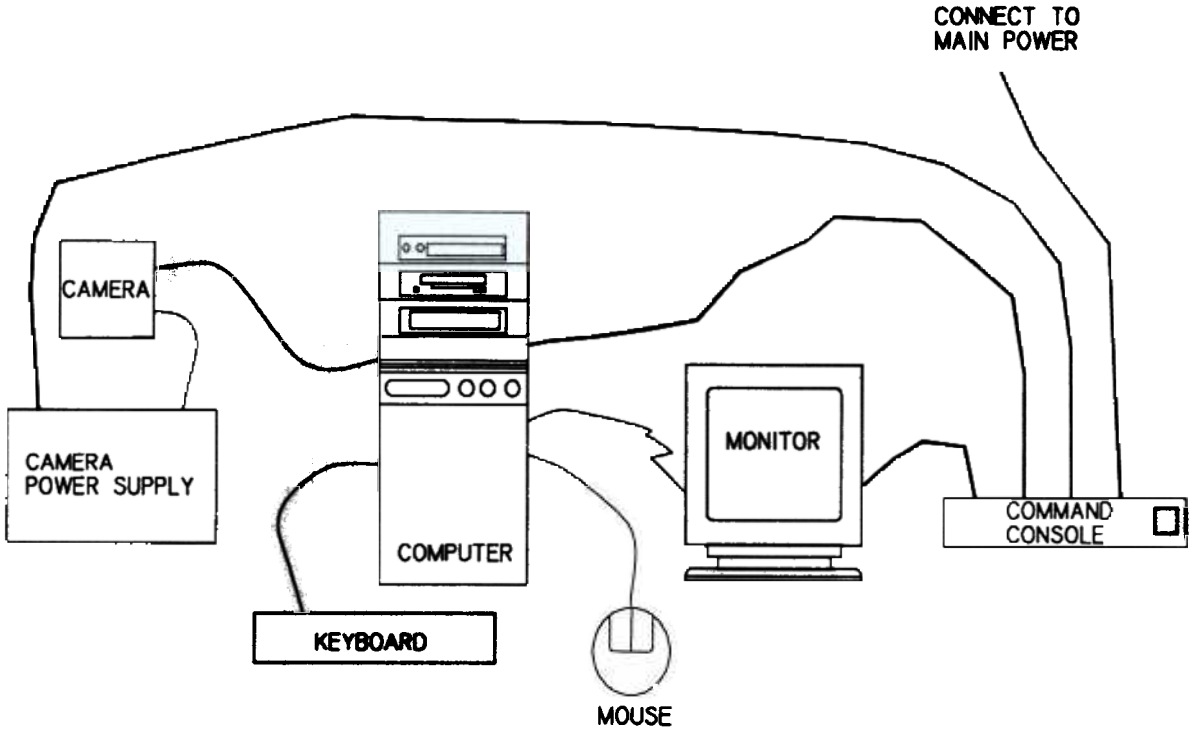
This unit is guaranteed against defective material and workmanship for a period of two (2) years from the date of receipt by customer. Warranty is void if inspection shows evidence of abuse, misuse or unauthorized repair. Warranty covers only replacement of defective materials. If, for any reason, this unit must be returned to BUEHLER for warranty service, please apply for prior authorization with shipping instructions, and include the following information: Customer Purchase Order Number, Buehler Ltd. Invoice Number and Date, Serial Number, and reason for return.

Unpacking

Carefully unpack and check contents. If any components are missing or damaged, save the packing list and material and advise the carrier and Buehler® Ltd. of the discrepancy.

System Components

Consists of 3 boxes:
1-Personal Computer (Per customer order)
1- Computer Monitor (Per customer order)
1- Camera, Cables, Instruction Manuals, Disks, etc.



Unit Connection Diagram

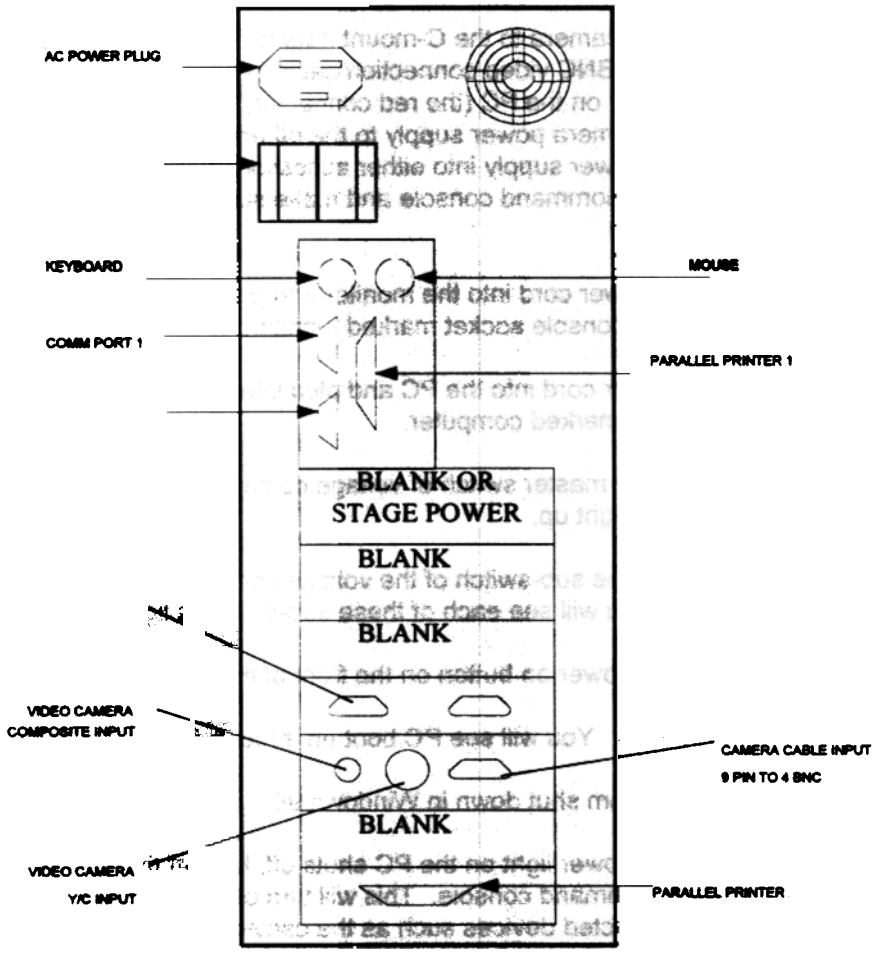


Figure 2-1 Rear Connection picture

NOTE: Make sure that the correct voltage is selected for proper use.

Check that the voltage selector on the rear of the PC is set to your local voltage (110V or 220V).

Check the voltage command console to make sure you have the one for your voltage.

Place the monitor on top of the voltage command console.

Place the PC either adjacent to monitor or below table, there are cable extensions for the keyboard and mouse for this purpose.

Connect the monitor signal cord to the port on the PC marked monitor.

Connect keyboard to the PS/2 port marked keyboard.

Connect mouse to the PS/2 port on the rear of the PC marked mouse.

Attach the camera to the C-mount adapter on the microscope. Connect the 12 foot BNC video connection cable between the camera and the video port 1 on the PC (the red connector). Connect the power cable from the camera power supply to the other connector on the camera. Plug the power supply into either accessory 1 or accessory 2 outlet at the rear of the command console and make sure the switch on the power supply is on.

Insert a power cord into the monitor and plug the other end into voltage command console socket marked monitor.

Insert power cord into the PC and plug into voltage command console in the socket marked computer.

Turn on the master switch of voltage command console. The master switch will light up.

Switch on the sub-switch of the voltage command console marked monitor, you will see each of these sub-switches light up.

Press the power on button on the front of the monitor.

Turn on PC. You will see PC boot up through BIOS to Windows 98

Select system shut down in Windows 98.

When the power light on the PC shuts off, turn off the master switch of Voltage command console. This will turn off power to the monitor and other connected devices such as the camera.

For systems with the motorized stage option:
Place the joystick box (if purchased) on either side of the monitor (to suit user). Connect the supplied serial cables to comm port 1 on the rear of the Omnimet Enterprise PC, and the other end to the serial port of the joystick to one of the spare auxiliary outputs on the voltage command console. With the command console on, switching the rear power switch on the back of the joystick box should illuminate the red LED called "Field/ Step" on the front panel of the joystick.

Please note that your Omnimet system is preconfigured with Windows98, Office 2000, and Buehler Omnimet Software. It is not necessary to load any of this software again.

Please note that if your system has a Millennium II VGA card installed, the system has two connectors, one blue 15 pin connector for the monitor and one black connector that is not used. If your system has a G200 VGA card installed, it only has one blue 15 pin connector for the monitor.

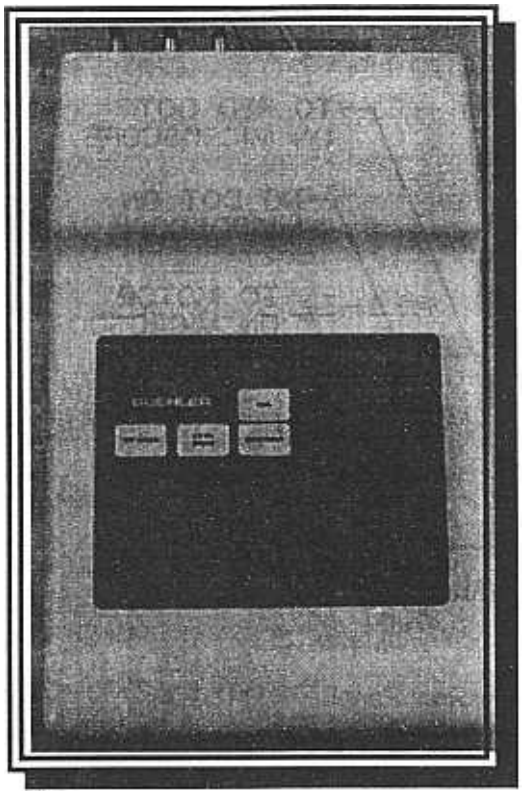


Figure 2-2 Stage Control Front Panel

On the front of this panel you will find all of the control buttons. For instance, the stage controller has a RUN, SET ORIGIN, GO TO ORIGIN, AUTO FOCUS, X, Y, Z, and STEP/FIELD buttons. The stage control box also comes equipped with a joystick to control the movement of the stage.

RUN is used to run a routine. Set origin will set the X,Y origin from the stage controller. GO TO ORIGIN will set the microscope back to the X,Y origin that was selected. AUTO FOCUS will make the Enterprise software automatically focus the image with the stage controller. The X, Y, Z radio buttons will move the stage in each direction either by step or by field. The joystick enables the user to move around the sample placed on the microscope.

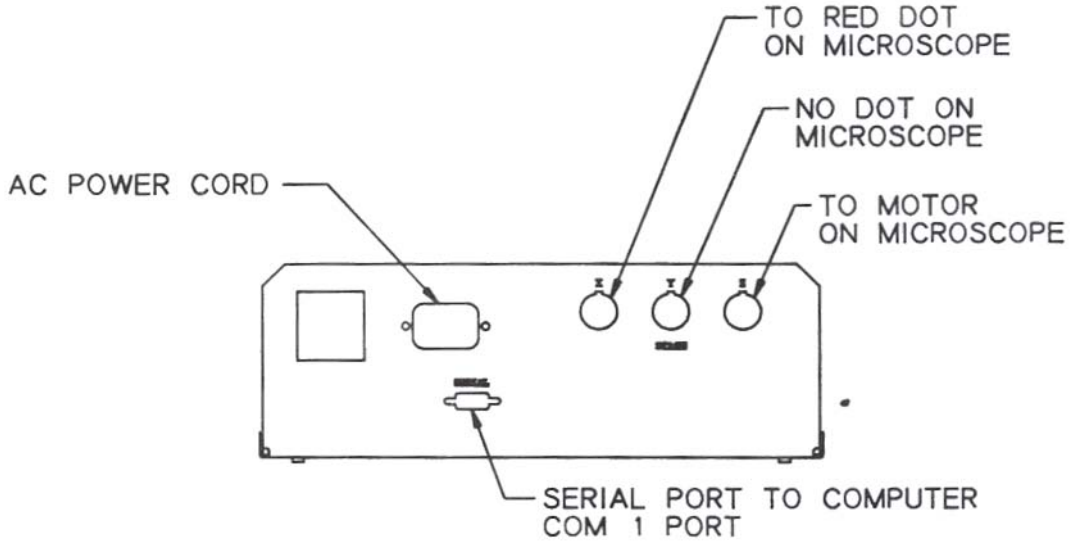
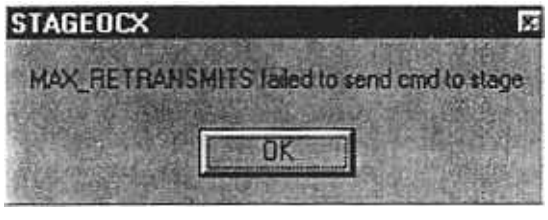
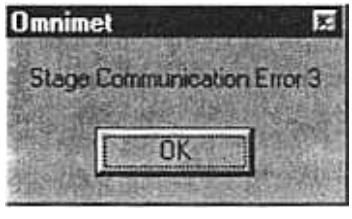


Figure 2-3 Stage Control Rear Panel

Figure 2-3 shows the rear panel of the stage control box. Connect the AC power cord from the stage controller box to the power outlet. Connect the three motor cables from the stage controller box to the stage on the microscope. Connect the serial port to the computer on comm 1 port. When everything is connected turn the power switch on. Make sure that the power switch is turned on before running Enterprise.





If the above error messages come up while trying to run Enterprise, close down Enterprise and check to make sure that the power switch is on or check that the comm port is the same one set up in the stage configuration program.

The earlier portion of this section details the assembly of the Omnimet Enterprise, it does not cover the configuration of the system, this is covered here.

Basically the user need not worry about setting the configuration as all Omnimet Enterprise Image Analysis Systems leave the Buehler factory with optimal system settings. It is therefore recommended that these are not adjusted since this may lead to a degradation in performance or worse, a non working system. In case of accidental loss of the settings they are given here:

PC Desktop Display Properties – Settings:

Display Resolution Millennium II VGA card:	1152x864
Display Resolution for G200 VGA card with a 19" or 21" monitor:	1600x1200
Color Palette:	True Color (32bit)
Font Size:	Large

The addition or execution of other devices and software programs may also impair the performance of the Omnimet Enterprise. The following apply:

Screen savers - These must not be used under any circumstance as they have a higher priority for the Pentium MMX resource than do other demanding applications like the Omnimet Enterprise. This can lead to a diminution of resource for the Enterprise software when a screen saver starts up and cause a system crash.

The energy saving feature for the monitor should also be disabled. This can be found under the "Display" icon in the Windows 98 Desktop "Control Panel". Click on "Display" icon to get the multi-tabbed "Display Properties" dialog window. Click on the "Screen Saver" tab, then click on "Settings to show the "Power Schemes Dialog. At the "Power Schemes Dialog", go to the drop down labeled "Turn Off Monitor", click on the down arrow and select "Never". Click the "Apply" button, then confirm and close all Dialog Windows with clicking on "OK". Finally, close Windows 98 Control Panel.

Virus detection software - While these are recommended, it is advised that they are disabled during long analysis runs, especially with motorized stage operation on multiple fields - again due to resource conflicts.

Software Installation for New System

All Enterprise systems are now shipped with the Win98 and MS Office and Enterprise 4.0 software preinstalled on your system by Buehler. The following procedure is provided here in case of hard drive failure.

Install **Windows 98**

2. Install **MS Office**
3. Install **Enterprise V4.00**. Insert the V4.00 CD ROM into CD ROM drive - **DO NOT RESTART PC AT END OF INSTALLATION!!**
4. Install **VGA driver for Windows 98**. If the system has a Millennium II VGA card go to **\Mga** directory of the CD-ROM and run **Setup**, select **English,** select **Typical**, click on **Next,** at end click **Finish,** then close matrox diagnostic. If the system has a G200 VGA card go to **\G200\w9x_513** directory of the CD-ROM and run **Setup**, select **English,** select **Typical**, click on **Next,** at end click **Finish,** then close matrox diagnostic Do not register.
5. Right mouse click
6. Select **Properties**
7. Click on **Settings** tab
8. Verify Color is **True Color 32 bit**
9. Verify Screen Resolution is **1152 X 864** for a Millennium II VGA card or **1600 X 1200** for a G200 VGA card.
10. Click on **Advanced**
11. In General tab verify that it has **Large Font**
12. Click on **Monitor** tab and verify that the correct Monitor is set.
13. Click **OK**
14. Click **OK**
15. Go to **Start**, **Settings**, **Control Panel**
16. Double click on **System** icon
17. Click on **Device Manager** tab
18. Click on **Matrox Imaging Adapter**

19. Select **Meteor PCI Frame Grabber** or if it does not appear, select other devices, PCI Multimedia Video Device.
20. Click on **Remove**
21. Click **OK**
22. Click **Close** to exit and exit out of **Control Panel**
23. Go to **Start**
24. Click **Find**
25. Select **File or Folders**
26. Click on **Browse**
27. Select **C:\Windows**
28. Input **meteor.vxd** into the Name input box
29. Click **FindNow**
30. Click on the file found and make sure it is highlighted. If not found, skip the next two steps.
31. Press **DEL** on the keyboard to delete the file
32. Click **Yes**
33. Input **dmapage.dll** in the Name input box
34. Click **FindNow**
35. Click on the file found and make sure it is highlighted. If not found, skip the next two steps.
36. Press **DEL** on the keyboard to delete the file
37. Click **Yes**
38. Exit out of Find
39. Restart PC
40. Windows will display a message stating that new hardware was found.
41. A dialog box will be displayed called **Install From Disk**
42. Select **Browse**, **Program Files\Buehler\Enterprise\ocx\Driver95\Meteor.inf or Meteor2.inf (depending on hardware)**
43. Click **OK**

44. **Insert Disk** message is displayed. If Insert Disk message box is not displayed, skip the next three steps
45. Click **OK**
46. **Copying Files** dialog box is displayed
47. Select **Browse**, **Program Files\Buehler\Enterprise\ocx\Driver95\dmapage.dll**
48. Click **OK**
49. System asks if you would like to restart the computer, Click **Yes**
50. Open Windows Explorer
51. Double click on Program Files
52. Double click on Buehler
53. Double click on Enterprise
54. Double click on ReportTemplate
55. Right mouse click on Enterprise Template2
56. Click Rename
57. Remove 2
58. Press Enter
59. Close Explorer
60. Run Enterprise and make sure that the live image is ok with no errors.

Upgrade Procedure from releases prior to 4.0

If you purchased your Enterprise system before 4.0 release, you can purchase an upgrade package including the Enterprise 4.0 software CD and the User's Manual, please follow the upgrade procedure below. **Note:** it is not necessary to run the uninstall for Enterprise when upgrading to newer versions. Doing so will delete previous configurations and settings, such as, objective database. If it is necessary to uninstall the Enterprise Software be sure to remove the Meteor driver from the system. It is highly recommended that all third party peripheral devices be removed from the system before starting the following upgrade procedure. The Windows 95/98 device drivers for these third party devices should also be removed from "Control Panel", "System", then "Device Manager". The network cards, Iomega Zip drive and "SCSI" driver for printer port based Zip drive may cause problems in the upgrade process.

Install **Enterprise V4.00.** Insert the V4.00 CD ROM into CD ROM drive- **DO NOT RESTART PC AT END OF INSTALLATION!!**

2. Install **VGA driver for Windows 95/98**. If the system has a Millennium II VGA card go to **\Mga** directory of the CD-ROM and run **Setup**, select **English,** select **Typical**, click on **Next,** at end click **Finish,** then close matrox diagnostic. If the system has a G200 VGA card go to **\G200\w9x_513** directory of the CD-ROM and run **Setup**, select **English,** click on **Next,** select **Matrox Millennium G200 AGP,** click on **Next,** click on **Next,** click on **Next,** at end click **Finish.** The system will be rebooted.
3. Right mouse click
4. Select **Properties**
5. Click on **Settings** tab
6. Verify Color is **True Color 32 bit**
7. Verify Screen Resolution is **1152 X 864** for a Millennium II VGA card or **1600 X 1200** for a G200 VGA card.
8. Click on **Advanced**
9. In General tab verify that it has **Large Font**
10. Click on Monitor tab and verify that the correct Monitor is set.
11. Click **OK**
12. Click **OK**
13. Go to Start, Settings, Control Panel

14. Double click on **System**
15. Click on **Device Manager** tab
16. Click on **Matrox Imaging Adapter**
17. Select **Meteor PCI Frame Grabber**
18. Click on Remove
19. Click **OK**
20. Click Close to exit and exit out of Control panel
21. Go to **Start**
22. Click **Find**
23. Select **File or Folders**
24. Click on **Browse**
25. Select C:\Windows
26. Input **meteor.vxd** into the Name input box
27. Click **FindNow**
28. Click on the file found and make sure it is highlighted
29. Press **DEL** on the keyboard to delete the file
30. Click **Yes**
31. Input **dmapage.dll** in the Name input box
32. Click **FindNow**
33. Click on the file found and make sure it is highlighted
34. Press **DEL** on the keyboard to delete the file
35. Click **Yes**
36. Exit out of Find
37. Restart PC
38. Windows will display a message stating that new hardware was found
39. A dialog box will be displayed called **Install From Disk**
40. Select **Browse**, **Program Files\Buehler\Enterprise\ocx\Driver95\Meteor.inf or Meteor2.inf**

(depending on hardware)

41. Click **OK**
42. **Insert Disk** message is displayed. If not displayed, skip the next three steps.
43. Click **OK**
44. **Copying Files** dialog box is displayed
45. Select **Browse**, **Program Files\Buehler\Enterprise\ocx\Driver95\dmapage.dll**
46. Click **OK**
47. System asks if you would like to restart the computer, Click **Yes**
48. Run Enterprise and make sure that the live image is ok with no errors.

After Install Omnimet V4.0 Software, shutdown system.

2. Turn off the power to the PC
3. Connect the Pixera camera to the Pixera card
4. Reboot the PC. When Message about new PCI multimedia device is displayed press **Cancel.**
5. Install **Pixera VCS 2.0** by running **setup.exe** from **root directory** of **Pixera CD-ROM.**
6. Click **Next.**

   Click **Yes.**
8. Click **Next.**
9. Click **Next.**
10. Click **Next.**
11. Click **Yes** when message about Video for Windows is displayed
12. Click **No** when message about Release notes is displayed
13. Select **No, I will restart my computer later** when message about restarting of PC is displayed and click **Finish**
14. Go to **Start, Settings, Control Panel**
15. Double click on **System**
16. Click on **Device Manager**
17. Click on **Other Devices**
18. Remove PCI Multimedia Device if it exists
19. Reboot the system with **Pixera CD-ROM**
20. When the display message says it detected new PCI Multimedia Device, click on **Next**
21. Select **Display a list of all drivers in specific location...**
22. Click **Next**
23. **Select Other devices**
24. **Next**

25. **Have Disk**
26. **Browse** to CD-ROM drive
27. Click on the **PCI** folder
28. Click on **OK**
29. Another message will be displayed to make sure the right drive and file are selected.
30. Click on **OK**
31. **Next**
32. **Next**
33. **Finish**
34. Reboot the system
35. Check the Display Resolution of PC. It should be 1152x864 for a system with the Millennium II VGA card, True Color 32 bit, Large Font.. It should be 1600 x 1200 for a system with a G200 VGA card and a 19" or 21" monitor, True Color 32 bit, Large Font.

There are two ways to use the Pixera camera:

A. Using it with a Twain interface viewfinder:

Run Omnimet **Config** program

2. Select **Setup**
3. Select **Interface**
4. Select **Twain Color**
5. Click on **OK**
6. Select **Setup** pull down menu
7. Click on **Camera Table**
8. Click on **Add Camera**
9. Type in the camera name
10. Click on **OK**
11. Set the **X size** to 1260 and the **Y size** to 960

12. Change **Input Channel** to 1
13. Click on **Apply**
14. Click on **Close**
15. Add a few objectives
16. Exit **Config program**
17. Run Omnimet Program and make sure the live image is fine without error message.
18. Capture an image and make sure that the image is 1260 x 960 and color.
19. Exit **Omnimet Enterprise System**
20. Shutdown system

B. Using a RS-170 b\w video camera as the viewfinder camera in conjuction with the Pixera camera:

1 Run Omnimet **Config** program
2 Select **Setup**
3 Select **Interface**
4 Select **Pixera and Meteor RS-170**
5. Click on **OK**
6. Select **Setup** pull down menu
7. Click on **Camera Table**
8. Click on **Add Camera**
9. Type in the camera name
10. Click on **OK**
11. Set the **X size** to 1260 and the **Y size** to 960
12. Change **Input Channel** to 1
13. Click on **Apply**
14. Click on **Close**
15. Add a few objectives

16. Exit **Config program**
17. Run Omnimet Program and make sure the live image is fine without error message.
18. Capture an image and make sure that the image is 1260 x 960 and color.
19. Exit **Omnimet Image Archive System**
20. Shutdown system
21. Go into **Windows Explorer**
22. Double click on the **Windows** folder
23. Scroll down to **Imageocx.ini** and double click on it
24. Make the following settings according to the light source used. The table below lists the different possible light source and their settings.

Example settings for a Halogen light source:

[Pixera]

WB Red = 100

WB Green = 170

WB Blue = 190

Orientation = 0

The following are the settings for Orientation options to be used in order to make the image from Pixera camera match with the image from the View Finder camera:

Orientation = 0 – this is the default setting.

Orientation = 1 – this will flip the image

Orientation = 2 – this will mirror the image

Orientation = 4 – this will cause the image to rotate 180°

The following are the possible light sources:

Light Source	WB Red	WB Green	WB Blue
Daylight	100	100	100
Fluorescent	88	91	115
Tungsten	100	150	150

Steps on Installing Polaroid DMC Ie Digital Camera and Software

1 Go to Start
2. Click Find
3. Select File or Folders
4. Click on Browse
5. Select C:\Windows
6. Click OK
7. Type asc.mpd into the Name input box
8. Click Find Now
9. Click on the file found and make sure it is highlighted
10. Press F2 on the keyboard to rename it.
11. Rename the file to asc.mpd1 and press Enter
12. Insert Advansys SCSI CD into CD-ROM drive
13. Click "SuperInstall Drivers"
14. Click "Finish"
15. Shut down the computer then install Advansys SCSI Card in the second PCI slot from top.
16. Reboot the PC. When Message "Insert Windows 98 Second Edition CD" is displayed, insert Advansys SCSI CD into CD-ROM drive and click OK.
17. When asked for asc.mpd file click "Browse". Select the CD-ROM drive. Click OK.
18. Shut down the computer.
19. Connect the DMC_Ie camera to the Advansys card outside connector.
20. Turn on the camera (it will produce some noise).
21. Insert Omnimet CD into CD-ROM drive
22. Turn on the PC.
23. When message about "New device found" is displayed, click "Browse' Select the CD-ROM drive.
24. Select DMC_Ie \ V1.21 on Omnimet CD.
25. Click OK.
26. Click Next.
27. Open Windows Explorer.
28. Explore Omnimet CD. Explore DMC_Ie. Explore V1.21
29. Double Click on setup.exe to run setup.
30. Click Next

31. Click Yes
32. Click Next
33. Uncheck View Readme file. Click Finish
34. Click Start
35. Click Programs
36. Select Polaroid DMC_Ie
37. Click DMC_Ie to run it
38. Check if the camera works properly in preview window.
39. Exit the program.
40. Run the Config program (for the Omnimet).
41. Select Setup
42. Select Interface
43. Select Twain, Color
44. Click on OK
45. Setup pull down menu
46. Camera Table
47. Click on Add Camera
48. Type in the camera name
49. Click on OK
50. Change Input Channel to 1
51. Click on Apply
52. Click on Close
53. Add a few objectives. Click add. In objective name enter 10X click OK. Repeat use 100X for objective name OK.
54. Exit Config program
55. Run Omnimet Program and make sure the live image is fine without error message.
56. Capture an image and make sure that the image is 1600 x 1200 and color.
57. Exit Omnimet
58. Shutdown system

1 Place Dongle in LPT1

2. Connect the Mitsubishi printer in LPT2

3. Install the Rainbow driver by placing the Enterprise V4.00 CD in the CD-ROM drive

4. Go to **Windows Explorer**

5. Open the **D** drive

6 Double click on the **Rainbow** folder

7. Double click on **Setup.exe**

8. Click **Next**

9. Click **Yes** to agree to the License Agreement

10. Put a check in the box for "Sentinel System Driver-English"

11. Click **Next**

12. Click **Next**

13. Click **Finish** to end setup

14. Restart the PC

15. Go to **Windows Explorer, C:\Rainbow\English\Driver\Win_95\Sentw95.exe** to configure Rainbow to only use LPT1

16. Click on **Functions** pulldown menu

17. Select **Configure Sentinel Driver**

18. Double click on Physical Address **378**

19. In "**Use this port**" check **Yes**

20. Click **OK**

21. Click **OK** to accept changes

22. Double click on Physical Address **278**

23. In "**Use this port**" check **No**

24. Click **OK**

25. Click **OK** to accept changes

26. Click **OK** to restart PC

27. Go to Functions pulldown menu and **Quit Program**

28. Restart PC

29. Insert the **SuperPrint** CD in the CD-ROM drive and the setup disk in drive A

30. Click **Install SuperPrint**

31. Click **Next**

32. Click **Yes** to agree to the License Agreement

33. Type in the **Users Name**, **Company Name**, and **Serial Number**

34. Click **Next**

35. Click **Yes** to verify the information is correct

36. Select **Typical** and click **Next**

37. Click **Next** to begin the installation

38. Under Manufacturers select **Mitsubishi**

39. Under Printer select **Mitsubishi CP700DU**

40. Verify that the correct port is selected

41. Click on **Have Disk**

42. Click **Browse**

43. Click **Open**

44. Click **OK**

45. Click **Done**

46. Click **Finish**

47. Close all programs and restart PC

48. Start **Enterprise**

49. Print an Image

Note: Before you print an image make sure that the paper settings are set to **L Size**

Video Input Configuration Program

Introduction

If you have ordered the standard resolution package, your image analysis system comes with a CCIR 756X570 pixel array black and white camera. If you have ordered either of the high resolution packages your image analysis system will come with a 1260X960 pixel array Pixera camera or a 1600X1200 Polaroid DMC Ie camera. Alternatively you may have ordered a color camera which are dealt with later in this section. This section of the Chapter 3 deals with CCIR 756X570 B&W camera installation.

Your image analysis system will come with the appropriate camera, factory installed in this configuration program.

The following table shows the color connector to hook the camera cable to for each input channel in the case of the CCIR camera.

Cable Connector	Input Channel
Red	1
Green	2
Blue	3
Black	4

Table 3-1 Camera Cable Connectors

Getting Started: 1 Camera and 1 Microscope

The following procedure assumes you are using the image analysis system for the first time. You will need to undertake the following steps to configure the system hardware to customize your system for your microscope.

Open Hardware Configuration Program

To open the hardware configuration program, double click on the icon on the desktop. If this icon is not present, the config program can be found in the Omnimet Enterprise group in the Start menu. After opening, you will see the hardware configuration main dialog box (Figure 3-1).

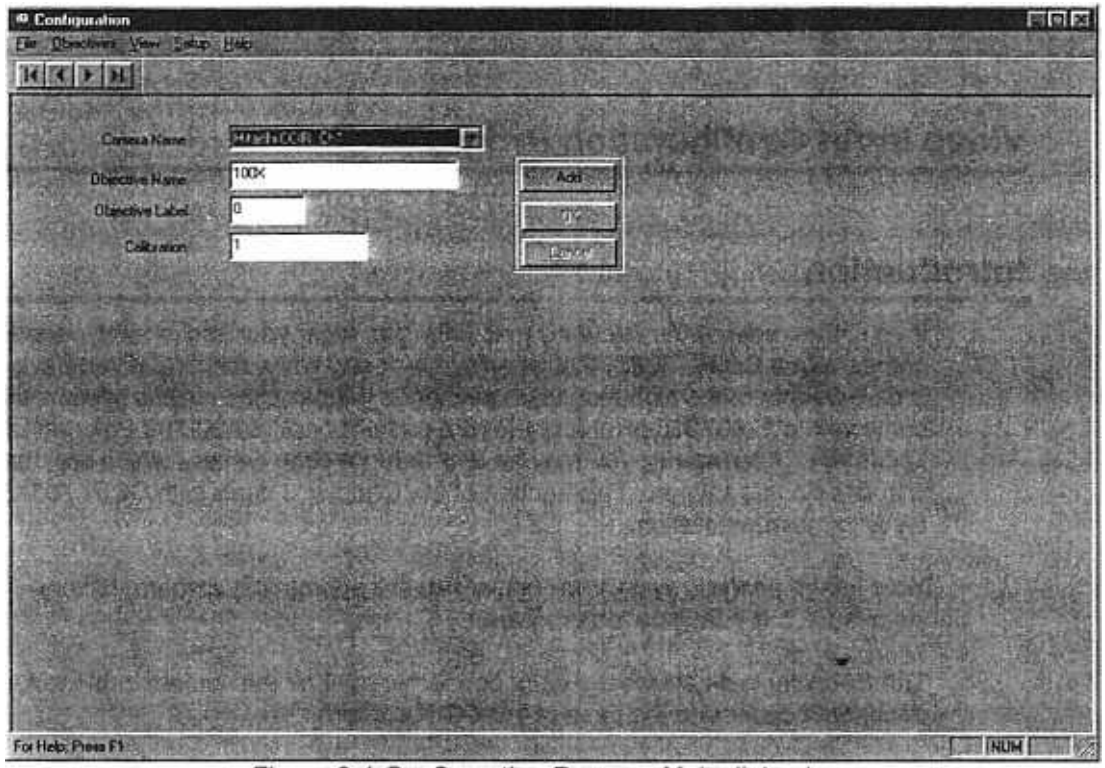


Figure 3-1 Configuration Program Main dialog box

Set Camera Name

Under "Camera Name" you should see "Hitachi CCIR, Ch1." Make sure the camera is connected to the red camera cable (channel 1). Select "Setup" pull down menu choice "Camera Table" (Figure 3-2) This will result in "Camera Setup" Dialog box appearing (Figure 3-3).

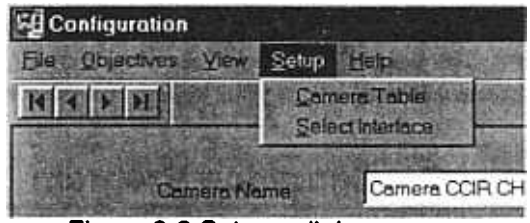


Figure 3-2 Setup pull down menu

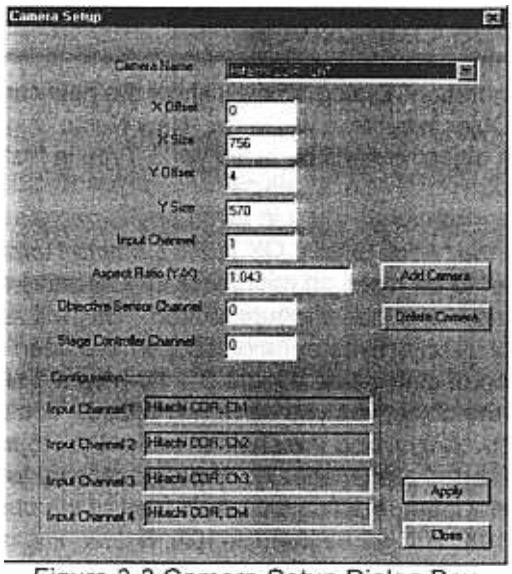


Figure 3-3 Camera Setup Dialog Box

Make sure "Camera Name" entry is "Hitachi CCIR, Ch1." If it shows some other name use pull down list to change to "Hitachi CCIR, Ch1." Note "Hitachi CCIR, Ch1" is shown under Input Channel 1 in grayed out box at bottom (Figure 3-3).

Click on "Delete Camera" button to remove Hitachi Camera 1. There must be a minimum of 1 camera set for an interface. If all the cameras are deleted the Add Camera dialog box will automatically pop up to insert a camera. Note: Input channel 1 gray box will go blank.

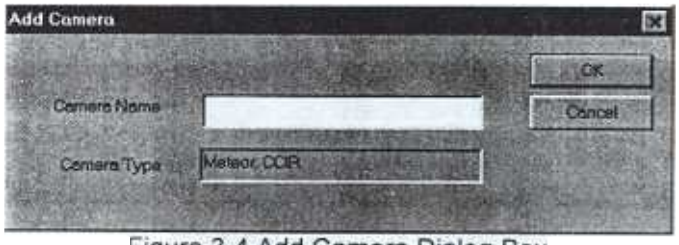


Figure 3-4 Add Camera Dialog Box

Click on "Add Camera" button. This will cause "Add Camera" dialog box to open (Figure 3-4). Type the name of the new camera source (e.g. Nikon Epiphot) and click OK. This will close "Add Camera" dialog box.

The new camera source (e.g. Nikon Epiphot) will be shown in Camera name box. Check that the camera settings are Buehler standard Hitachi CCIR B&W camera default setting (Figure 3-3) except for Input channel which should show 0.

Go to "Input Channel", replace 0 with 1, and click on "Apply" button. This will select the new Camera Name (e.g. Nikon Ephiphot) to be the chosen source for Channel 1. The grayed out box next to Input Channel 1 should show new camera name (e.g. Nikon Epiphot). Click on "Close" button and return to main configuration dialog box (Figure 3-1).

If additional cameras are being added to the remaining video ports, simply repeat the above procedures starting with Click on "Add Camera" and insert the appropriate input channel number as detailed later in this section.

Set Microscope Objectives

The "Configuration" Dialog box will show the new camera name (e.g. Nikon Epiphot). Objective name will show "New Name" highlighted in black (no microscope objectives will be listed yet). Type in first microscope objective name such as 10X.

Clicking on the "Add" button will cause Camera Name to be grayed out, and "New Name" to be highlighted in black in "Objective Name" box. Type in next objective name and then click OK button. This will store the new objective. Repeat until all objectives on microscope have been added. Click on horizontal arrows at top of dialog box (Figure 3 – 1). You will see "Objective Name" toggle through all the objectives you have just added. You can also move through the list of objectives by using the choices under the Objectives menu. The objective names are sorted alphabetically. If it is necessary to have them in a specific order, place a letter, starting with A, in front of the objective name. For instance, instead of 10X, 20X name them A-10X, B-20X. The maximum limit of characters for the objective name is 8 characters long. If the objective name is larger than 8 characters long it will cause a problem when trying to archive an image to the database.

Confirm Other Factory Settings

While you are still in Configuration" dialog box, check "Objective label" box, factory presets should be 0 for all. Do not change this. Check "Calibration" box, factory presets should be 1. System is not yet calibrated.

Go to "Set Up" pull down menu (Figure 3-2) and click on "Select Interface." This will bring up "Camera Interface" Dialog Box (Figure 3-5)

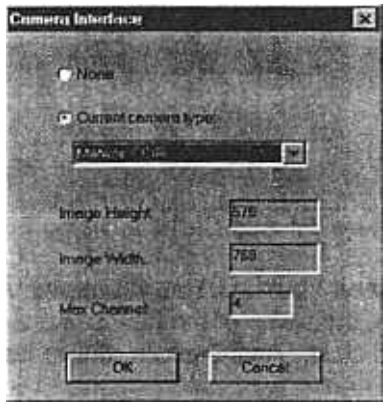


Figure 3-5 Camera Interface Dialog Box

Your unit will be factory preset to Current camera type (Meteor CCIR) as shown in Figure 3-5. Click on OK button to accept. If it is set on anything else, click the drop down box where Meteor, CCIR is to select it, and then click on OK button.

Adding Color Analog Cameras

Buehler supplies several options of color CCD cameras that may be used with the Omnimet Enterprise. Alternatively you may wish to attach an existing camera. Currently, color cameras of either composite or S video format are supported. Composite (NTSC, PAL) may be attached via the BNC connectors detailed in

Select Setup in the Configuration dialog to generate the drop down in Figure 3-6. From this, click on Select Interface to generate the Select Interface dialog shown below in Figure 3-7

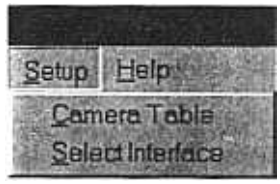


Figure 3-6 Config Setup pull down

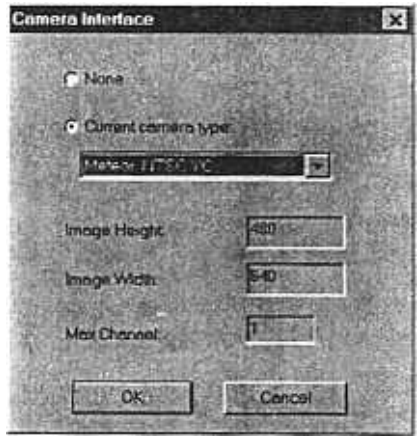


Figure 3-7 Select Interface dialog

Use the scroll button in the Select Interface dialog to change an appropriate format for the color camera being used and the frame grabber type (Meteor). For the Buehler supplied color camera options of 86-0800 and 86-0900 the appropriate selection will be Meteor, NTSC Y/C. It should be noted that while the 86-0900 camera is an RGB model it has to be used in Y/C mode. Add objectives for the new camera name as detailed in page 3-4.

Close Hardware Configuration Program

You will be returned to "Configuration" dialog box. Close configuration program by either using File pull down menu - Exit or clicking on X program icon in top right hand corner of configuration dialog box.

Adding Digital Cameras

The Omnimet Enterprise currently supports the Pixera and Polaroid DMC Ie digital cameras. The installation of the interface cards and drivers for these units is given in section 2, this section gives details on setting up the Configuration utility for both camera's.

For either camera, follow the steps given previously to open the Select Interface dialog.

For the Pixera camera make the following selection in the dialog:

Pixera with a b/w view finder camera: Select Pixera and Meteor, RS-170

Pixera with its own view finder: Select Twain Color

For the Polaroid DMC Ie digital camera make the following selection in the dialog:

Polaroid DMC Ie I monochrome mode: Twain, B/W

Polaroid DMC Ie I color mode: Twain, Color

Add objectives to the new camera name for this interface as detailed on page 3-7.

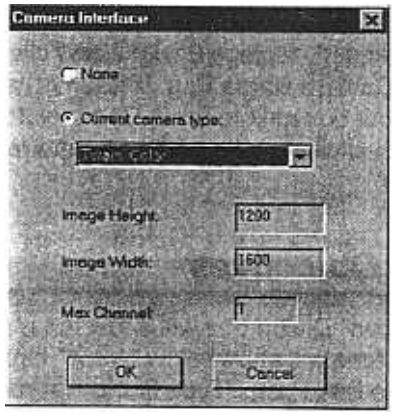


Figure 3-8 Select Camera Interface with Twain Selection

Confirm Configuration

The Enterprise program is opened by clicking on the icon. Calibration of the individual microscope objectives occurs inside the Enterprise program.

Click on the capture image icon to freeze the image. Select pull down menu Setup-select camera and verify your new camera source is listed (e.g. Nikon Epiphot). Use objective pull down menu at top right hand corner of Enterprise screen and verify that the objectives stored match what were just entered.

Proceed to Section 5 of the manual for the procedures to calibrate objectives.

Advanced: 2 Cameras and 2 Microscopes

Follow the previous procedure for installing 1 camera and 1 microscope. Then, after calibrating the first microscope in the Enterprise, close Enterprise and re-open Hardware configuration program by clicking on icon. Add second camera to new microscope source (#2) and plug into the green camera cable.

In Configuration dialog box go to "Setup" pull down menu and click on "Camera Table." This will open up "Camera Setup" dialog box.

Go to Camera name pull down list and select (highlight in black) "Hitachi CCIR Ch2. " It should list input channel as "2." Click on "Delete" button to delete this camera name. The gray Input channel 2 box in the lower half of the Camera Setup dialog box should now be blank.

Click on "Add Camera" button. This will cause "Add Camera" dialog box to open (Figure 3-4). Type the name of the new camera source (e.g. Versamet) and click OK. This will close "Add Camera" dialog box.

The new camera source (e.g. Versamet) will be shown in Camera name box. Check that the camera settings are Buehler standard Hitachi CCIR B&W camera default setting (Figure 3-3) except for Input channel which should read 0.

Go to "Input Channel", replace 0 with 2 and click on "Apply" button. This will select the new Camera Name (e.g. Versamet) as the chosen source for Channel 2. The grayed out box next to Input Channel 2 should show new camera name (e.g. Versamet). Click on "Close" button and return to main configuration dialog box (Figure 3-1).

Set Microscope Objectives

The "Configuration" Dialog box will show the new camera name (e.g. Versamet). The Objective name will show "New Name" highlighted in black (no microscope objectives will be listed yet). Type in the first microscope objective name such as 10X.

Clicking on the "Add" button will cause Camera Name to be grayed out, and "New Name" to be highlighted in black in "Objective Name" box. Type in the next objective name and then click OK button. This will store the new objective. Repeat until all objectives on microscope have been added. Click on horizontal arrows at top of dialog box. You will see "Objective Name" toggle through all the objectives you have just added. You can also look at the current microscope objectives by using the Objectives pull down menu.

Confirm Other Factory Settings

You are still in "Configuration" dialog box. Check "Objective label" box, factory presets should be 0 for all. Do not change. Check "Calibration" box, factory presets should be 1. System is not yet calibrated.

Go to "Set Up" pull down menu (Figure 3-2) and click on "Select Interface." This will bring up "Camera Interface" Dialog box (Figure 3-5)

Your unit will be factory preset to Type (Meteor CCIR) as shown in Figure 3-5. Click on OK button to accept. If it is set on anything else, click the radio button next to Type to select it, and then click on OK button.

Close Hardware Configuration Program

You will be returned to "Configuration" dialog box. Close configuration program by either using File pull down menu -Exit or clicking on X program icon in top right hand corner of configuration dialog box.

Confirm Configuration

The Enterprise program is opened by clicking on the icon. Calibration of the individual microscope objectives occurs inside the Enterprise program.

Click on the capture image icon to freeze the image. Select pull down menu Setup-select camera and change to your new camera source (e.g. Versamet). Use objective pull down menu at top right hand corner of Enterprise screen and verify the objectives stored match what you just entered.

Proceed to Section 5 of the manual for procedures to calibrate objectives.

Advanced: Multiple Cameras and Microscopes

Follow the earlier procedure for adding second camera and microscope, but delete Hitachi CCIR, Ch3 and add third camera to Input Channel 3. Physically connect 3rd camera to the blue camera cable.

Add 4th camera by deleting Hitachi CCIR, Ch4 and adding 4th camera to Input channel 4. Physically connect 4th camera to the black camera cable.

Advanced: Only 1 Camera but 2 Microscopes

You may want to configure your system for 1 camera but multiple microscopes. Use the same procedure as adding second camera and camera source, but rather than physically attaching a new camera to the green cable simply move camera 1 from the red cable to the green cable when doing calibration.

Introduction

The stage configuration program allows the addition of a new stage configuration, or the deletion of an old one. The user is able to set the x, y, z pitch, set inverse settings, set maximum speed, select cameras, select com ports, set focus axis, set backlash, and set the focusing interval.

Open Stage Configuration Program

To open the stage configuration program, double click on the [redacted] icon on the desktop. If this icon is not present, the stage program can be found in the Omnimet Enterprise group in the Start menu. After opening, you will see the stage configuration main dialog box (Figure 3-9 below).

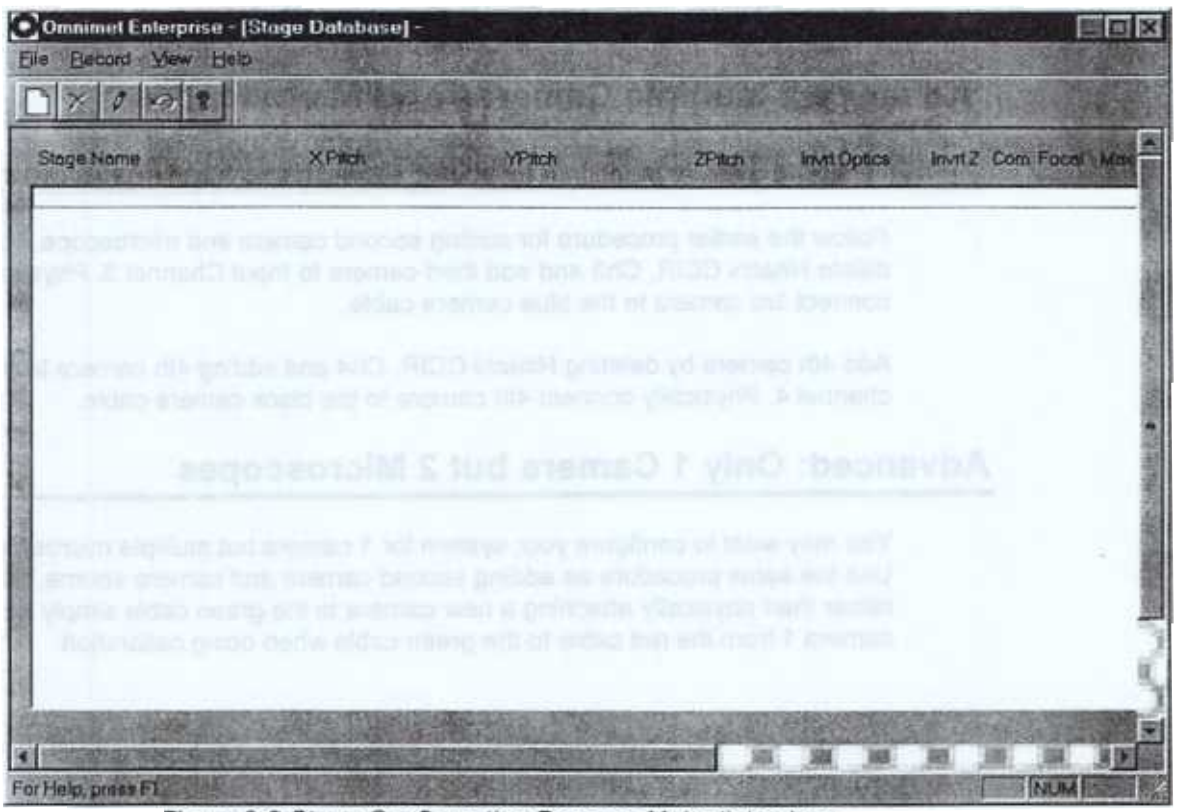


Figure 3-9 Stage Configuration Program Main dialog box

Add a Record

To add a new record to the database:

1. From the main menu, click on **Record.**
2. Select **Add Record**.
3. Type in new record in the **Edit Stage Setting** window.

Or

1. Click the button in the main toolbar.
2. Type in new record in the **Edit Stage Setting** window.

   Adding a record will generate default values for the stage parameters, the user is free to change these.

Delete a Record

To delete a record in the database:

1. Click on the record that you wish to delete.
2. From the main menu, click on **Record.**
3. Select **Delete Record**.

Or

1 Click on the record that you wish to delete.

2. Click the button in the main toolbar.

Edit a Record

To edit a record in the database:

1. Click on the record that you wish to edit.
2. From the main menu, click on **Record.**
3. Select **Edit Record**.

Or

1. Click on the record that you wish to edit.
2. Click the button in the main toolbar.

Please note that it is not possible to edit the stage name since this is a "key" heading in the stage database.

Undo

To undo the last action:

1. From the main menu, click on **Record.**
2. Select **Undo**.

Or

1 Click the button in the main toolbar.

Edit Stage Setting Window

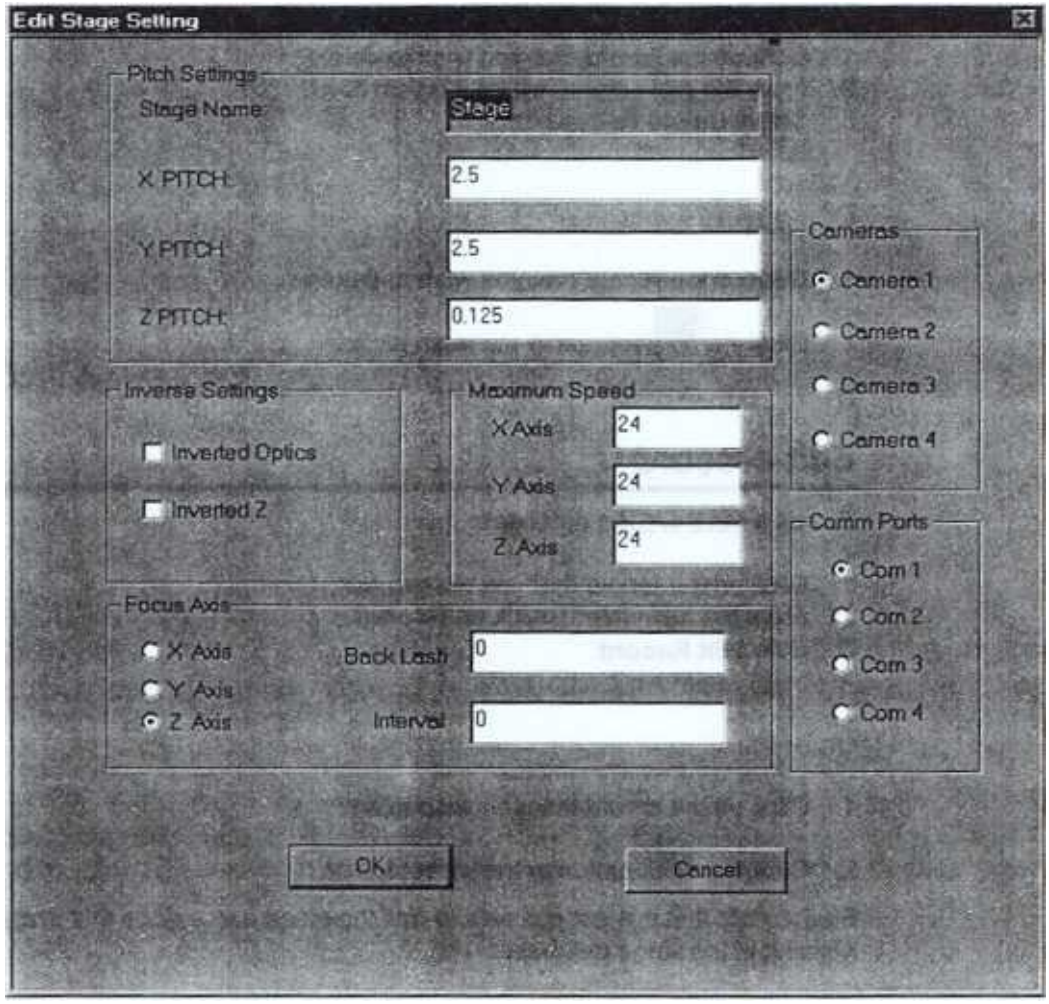


Figure 3-10 Edit Stage Setting Window

Set the X, Y, Z Pitch

The **X Pitch** is the distance per pulse that the step motor can travel in X-axis. The unit is μm/pulse.
The **Y Pitch** is the distance per pulse that the step motor can travel in Y-axis. The unit is μm/pulse.
The **Z Pitch** is the distance per pulse that the step motor can travel in Z-axis. The unit is μm/pulse. Figure 3-11 from the Edit Stage Setting Window, shows the input boxes for the X Pitch, Y Pitch, and the Z Pitch.

To set the X, Y, Z pitch:

1. From the main menu, click on **Record**.
2. Select **Edit Record**.
3. Change the value in the input box.

Or

1. Click the button in the main toolbar.
2. Change the value in the input box.

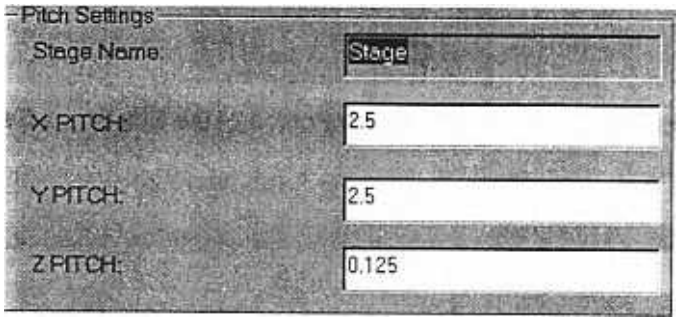


Figure 3-11 Pitch Settings Portion of the Edit Stage Setting Window

The X, Y and Z Pitch settings should be calibrated for the particular microscope and stage used. The pulses of X, Y and Z motors are displayed on the status bar at the bottom of the Enterprise application. User can move the stage by the joystick on the stage controller and measure the distance moved with a ruler or micrometer. The X Pitch can be calculated by dividing the distance in X by the changes of X motor pulses. The Y and Z Pitch can be calculated in the same manner. For rectangular XY stage, the Z motor is used for autofocus. A larger autofocus movement can be obtained by using a smaller value of Z Pitch setting.

Set the Inverse Settings

The inverse settings portion of the Edit Stage Setting Window allows the user to configure the Enterprise so that the motorized stage and focus is driven correctly for the microscope in question. Figure 3-12 shows the check boxes that may be selected. Inverted optics will drive the X Y motor in the opposite directions to default thus allowing for microscopes with optical inversions, invert Z will allow the user to ensure that the focusing direction is correctly set.

To set the inverse settings:

1. From the main menu, click on **Record**
2. Select **Edit Record**.
3. Change the value in the input box.

Or

Click the [redacted] button in the main toolbar.

2. Change the value in the input box.

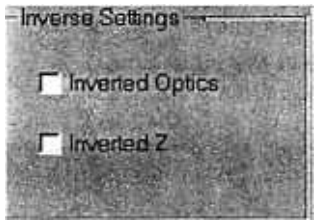


Figure 3-12 Inverse Settings Portion of the Edit Stage Setting Window

Set the Maximum Speed

The recommended maximum speed setting is 24 for all three input boxes. The three options can be set to different values to suit individual needs. However it should be noted that very high values may cause the stepping motors to stall. Figure 3-13 from the Edit Stage Settings window, shows the input boxes for the X-axis, Y-axis, and the Z-axis with the default settings. Please note that if 0 is chosen for any of the settings then the value of 24 is used.

To set the maximum speed:

1. From the main menu, click on **Record**.
2. Select **Edit Record**.
3. Change the value in the input box.

Or

1. Click the button in the main toolbar.
2. Change the value in the input box.

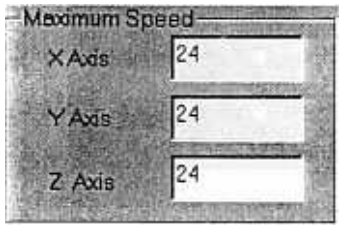


Figure 3-13 Maximum Speed Setting from the Edit Stage Setting Window

The radio buttons allow the selection of the camera input channel that is to be associated with the motorized stage. Figure 3-14 below from the Edit Stage Settings window, shows the selection box of the four cameras that may be used in conjunction with the stage.

To select the camera:

1. From the main menu, click on **Record**
2. Select **Edit Record**.
3. Click the camera that the stage uses.

Or

1. Click the button in the main toolbar.
2. Click the camera that the stage uses.

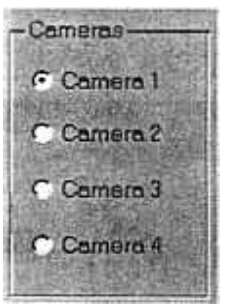


Figure 3-14 Camera Setting Portion from Edit Stage Setting Window

Select Com Ports

Figure 3-15 below from the Edit Stage Settings window, shows the different com ports to configure the stage controller to. The radio buttons allow the selection of the com port used to connect the stage controller.

To select the com ports:

1. From the main menu, click on **Record**.
2. Select **Edit Record**.
3. Click the com port that the stage uses.

Or

1. Click the button in the main toolbar.
2. Click the com port that the stage uses.

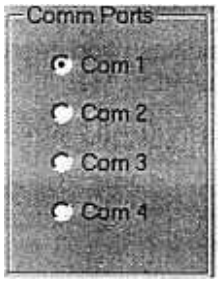


Figure 3-15 Com Ports Portion from the Edit Stage Setting Window

Set the Focus Axis, Backlash, & Interval

The radio buttons for the X-axis, Y-axis, and Z-axis allow the choice of other than the Z-axis for focusing. The Z-axis is normally the one used, the choices of X and Y are for special applications. The backlash is the backlash of the focus motor and of the mechanics of the microscope to which the motor is attached. The interval is the maximum interval for focusing. Figure 3-16 below from the Edit Stage Settings window, shows the input boxes for the focus axis, backlash, and interval.

To set the focus axis, backlash, & interval

From the main menu, click on **Record**.
2. Select **Edit Record**.
3 Z-axis is the default for focus.
4 You can change the backlash and interval settings in the input boxes.

Or

Click the button in the main toolbar.
2. Z-axis is the default for focus.

3 You can change the backlash and interval settings in the input boxes (0 is the default, which is equivalent to 15).

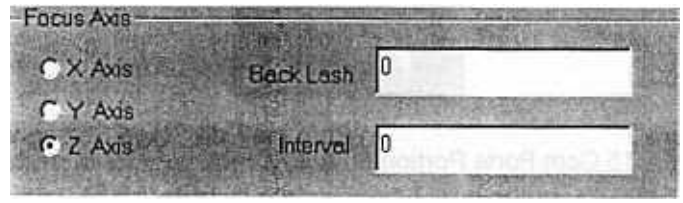


Figure 3-16 Focus Axis Portion of the Edit Stage Setting Window

Starting the Enterprise

In order to start the Enterprise, double-click on the icon on the desktop or click on Enterprise in the Start Menu. The graphic user interface seen below in Figure 4-1 with the database view will appear after Enterprise is launched. When an image is opened it will generate an image window over the database view.

Below are some of the basic functions necessary for getting started with the Enterprise.

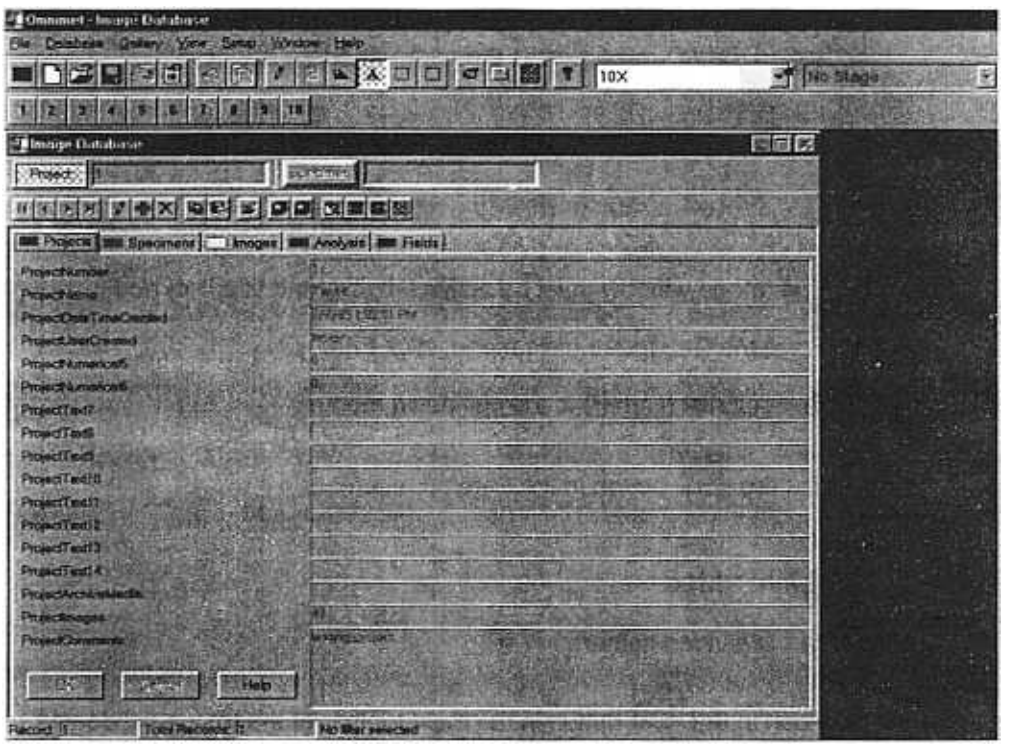


Figure 4-1 Enterprise Main Screen with database view

Image Functions

Open an existing image

1. From the main menu, click on **File**.
2. Select **Open Image** in the pull down menu.
3. Navigate to the folder that contains the image to be opened

4. Select the image.

5. Click **Open** button

Steps 1 and 2 can be skipped by clicking on in the Enterprise toolbar

Save an image

1 The Image window must be active (Highlighted title bar) and frozen

2. From the main menu, click **File**.

3. Select **Save** (Ctrl+S) or **Save As**

4 Use **Save As** to save the image to the specified folder with a specific name for the image.

5. Use **Save** to save the image to the original image file. If a new image to be saved, **Save** works exactly the same as **Save As**.

Or click in the Enterprise toolbar.

Printing an image

1 The Image window must be active (Highlighted title bar) and frozen

2. From the Enterprise main menu, click **File**.

3. Select **Print** (Ctrl+P) in the pull down menu

Or click the button in the Enterprise toolbar.

Start live video

To start live video camera:

1 Push in the button in the main toolbar of the Image window.

To stop live video and to capture/freeze image:

Release the button in the main toolbar of the Image window.

Open an existing routine

1 From the main menu, click **File**.

2. Select **Open Routine** in the pull down menu.

3. Navigate to the drive, directory and folder that contain the desired routine to be opened.

4. Click on the routine to be opened.

5. Click **Open**.

Save a routine

1 The Routine Window must be the active window (Highlighted title bar)

2. From the main menu, click **File**.

3. Select **Save** (Ctrl+S) or **Save As**.

4. Use **Save As** to save the routine to the specified folder with a specific name for the routine.

5. Use **Save** to save the routine to the original routine file. If a new routine has been saved, **Save** works exactly the same as **Save As**.

Or

Click in the Enterprise toolbar.

Print a routine

The Routine Window must be the active window (Highlighted title bar)

2. From the Enterprise main menu, click **File**.

3. Select **Print** (Ctrl+P) in the pull down menu.

Or click the button in the Enterprise toolbar.

Execute routine step

This function is used to execute the routine one step at a time. However, this function can only be used to execute the routine sequentially. Otherwise the **Execute step** button in the Routine window toolbar or the **Execute Step** menu item in the Enterprise main menu will be disabled.

To use Execute step:

1. Make sure the step that you plan to apply the **Execute Step** function to, is highlighted.
2. From the Enterprise main menu, click **Routine**
3. Select **Execute Step** in the pull down menu.

Or

1. Make sure the step that you plan to apply the **Execute Step** function to, is highlighted.
2. Click the button in the Routine window main toolbar

Repeat the above procedures for the next highlighted step in the Routine window

Execute all steps in routine

To execute all of the steps in a routine:

1. From the Enterprise main menu, click **Routine**.
2. Select **Execute All** in the pull down menu.

Or click the button in the Routine window main toolbar.

Execute routine to step

This function allows you to execute multiple steps in a routine.

To execute multiple steps:

1. Click any step that you'd like to execute to in the Routine window to highlight it.
2. From the Enterprise main menu, click **Routine.**
3. Select **Execute to Step** in the pull down menu.
4. All steps prior to the highlighted one will be executed.

Or

1. Click any step that you'd like to execute to in the Routine window to highlight it.
2. Click the button in the Routine window main toolbar

3. All steps prior to the highlighted one will be executed.

Results Window

Print report

1. The Result window has to be active (Highlighted title bar).
2. From the Enterprise main menu, click **File**.
3. In the pull down menu, click **Print Preview** to preview document.
4. In the pull down menu, click **Print**.

Print Option setup

1. From the Enterprise main menu, click **SetUp**.

   Select **Preferences** in the pull down menu.
3. Choose the desired options by clicking on them.
4. Click **OK**.

Exiting the Program

1. Click **File** from the Enterprise main menu.
2. Select **Exit** in the pull down menu.

Calibration

The Omnimet Enterprise is a Quantitative Image Analyzer that allows the user to conduct quantitative measures of the presented image. As such the Omnimet must be calibrated to the users microscope, this is detailed later in this section.

In order to calibrate an objective, the objective must first be added to the objective database. This is done in the Hardware Configuration Program (see Section 3). After configuring the camera, verify that the correct camera is chosen. The name of the current camera is shown in the status bar on the bottom of the screen.

Setup Camera

1. From Enterprise main menu, select **Setup**.
2. Choose **Select Camera...** in the pull down menu. The image must be frozen to select the camera. Verify that the radial button selected matches the camera of interest and click **OK**.
3. The objectives associated with the selected camera will be displayed in the combo box of Enterprise's toolbar. The image must be live to change the objective.
4. Place the supplied traceable stage micrometer on the stage of the microscope and focus the rulings.

Before starting calibration, verify that the correct objective is shown in the list box on the Enterprise toolbar. If not, clicking on the arrow to the right of the box will cause a list of all the objectives available for this microscope to be displayed. Select the appropriate objective

Calibrate X Objective

If calibration is being under taken using a Buehler supplied camera, then the correct XY pixel ratio will have already been setup in the hardware setup (Section 3) and the user may then calibrate the microscope objectives using "Calibrate X objective". However, if the XY pixel ratio for the camera being used is not known, then it must be determined prior to calibrating the objectives.

1. To calibrate an objective, choose Setup, Calibrate Objective, Calibrate X.
2. Choose the desired unit in the **Units** window. (See Figure 5-1)
3. Move the caliper ruler by placing the mouse pointer on the caliper ruler, pressing down the left mouse button and dragging the mouse.
4. Align the left hand blade of the caliper to a micrometer ruling at left side of the screen.
5. Place the mouse pointer on the right leg of the caliper ruler, press down the left mouse button and drag the mouse to change the number of pixels. Open the caliper to as wide a distance as possible and align to a right most micrometer ruling.

6. Ensure that you align to either both left edges or both right edges of the micrometer ruling. Otherwise the thickness of the micrometer rulings comes into play.

7. After aligning the caliper, type the distance that the calipers cover in the **X Distance** box.

8. The **Aspect Ratio** shows the aspect ratio of the image pixels from the objective database assigned to the camera.

9. The **Image Pixels** shows the number of pixels between the legs of caliper ruler.

10. **Cal Factor** shows the Calibration Factor that changes according to the value in the Image Pixels window.

11. Click **OK**.

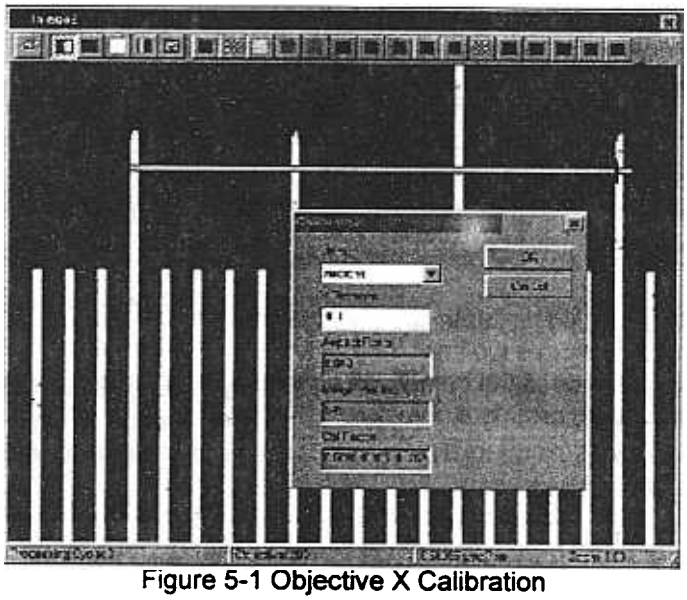


Figure 5-1 Objective X Calibration

Calibrate XY Objective

The Omnimet Enterprise has been designed to be modular and upgradeable. Part of this design requirement therefore allows the use of non-Buehler supplied cameras for which a preset X-Y pixel ratio may not be known. The ability to calibrate the image from the objective in both X and Y axis's therefore allows the system to calculate the correct X-Y ratio.

1. To calibrate an objective, choose Setup, Calibrate Objective, Calibrate XY.

2. Choose a desired unit in the **Units** window. (See Figure 5-2)

   Move the caliper rulers by placing the mouse pointer on the caliper rulers, pressing down the left mouse button and dragging the mouse.

4. To change the X axis pixel number: place the mouse pointer on the right leg of the horizontal caliper ruler, press down the left mouse button and drag the mouse.

5. After aligning the calipers, type the distance that the calipers cover in the **X Distance** box and the **Y Distance** box.

6. Click **OK**.

7 Return to a live image and rotate the calibration micrometer to a vertical orientation and repeat steps 1, 2, and 3.

8. To change the Y axis pixel number: place the mouse pointer on the lower leg of the vertical caliper ruler, press down the left mouse button and drag the mouse.

9. The **Image Pixels** shows the number of pixels between the legs of caliper ruler.

10. **Cal Factor** shows the Calibration Factor that changes according to the value in the Image Pixels window.

11. The **Aspect Ratio** shows the aspect ratio of the image pixels determined by the XY Calibration.

12. Click **OK**.

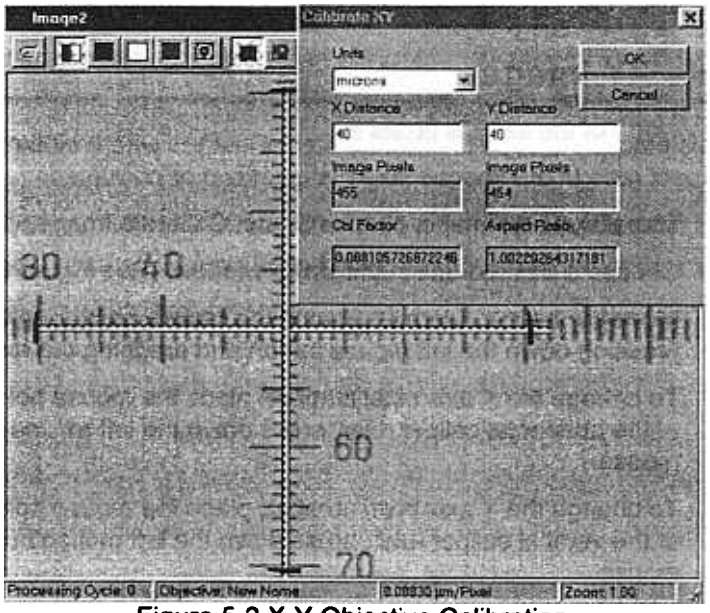


Figure 5-2 X-Y Objective Calibration

Calibrate Image

1. From the Enterprise main menu, click **Setup.**
2. In the pull down menu, click Calibrate Image.
3. In the expanded sub menu, select either **Calibrate X** or **Calibrate XY**.

Calibrate X Image

This function is used to calibrate a saved image that has no calibration, but was captured with a known aspect ratio.

1. To calibrate an image, choose Setup, Calibrate Image, Calibrate X.
2. Choose the desired unit in the **Units** window. (See Figure 5-1)
3. Move the caliper ruler by placing the mouse pointer on the caliper ruler, pressing down the left mouse button and dragging the mouse.
4. Place the mouse pointer on the right leg of the caliper ruler, press down the left mouse button and drag the mouse to change the number of pixels.
5. After aligning the caliper, type the distance that the calipers cover in the X Distance box.
6. Type in the **Aspect Ratio** of the image pixels.
7. The **Image Pixels** shows the number of pixels between the legs of caliper ruler.
8. **Cal Factor** shows the Calibration Factor that changes according to the value in the Image Pixels window.
9. Click **OK**.

Calibrate XY Image

This function is used to calibrate stored images where either the calibration or the aspect ratio of the images pixels is unknown or corrupted.

1. To calibrate an image, choose Setup, Calibrate Image, Calibrate XY.
2. Choose a desired unit in the **Units** window. (See Figure 5-2)
3. Move the caliper rulers by placing the mouse pointer on the caliper rulers, pressing down the left mouse button and dragging the mouse.
4. To change the X axis pixel number: place the mouse pointer on the right leg of the horizontal caliper ruler, press down the left mouse button and drag the mouse.
5. To change the Y axis pixel number: place the mouse pointer on the lower leg of the vertical caliper ruler, press down the left mouse button and drag the mouse.
6. After aligning the caliper, type the distance that the calipers cover in the X Distance box and the Y Distance box.
7. The **Image Pixels** shows the number of pixels between the legs of caliper ruler.
8. **Cal Factor** shows the Calibration Factor that changes according to the value in the Image Pixels window.
9. The **Aspect Ratio** shows the aspect ratio of the image pixels determined by the XY Calibration.
10. Click **OK**.

Shading Correction

The shading correction is used to correct minor lighting differences in the microscope when capturing images. Before setting the shading correction for an objective, make sure that the correct microscope and objective are set and that the illumination is optimally adjusted (i.e. that the microscope is set up for Kohler illumination). Pseudocolor is a useful tool for detecting uneven illumination and is a valuable aid in correctly adjusting the microscope illumination (see Section 7 for more information on Pseudocolor). Shading correction is only used for monochrome input.

Shading Correction Setup

Place a mirrored surface on the microscope stage and view its surface through the Enterprise.

2 Click on the Saturation icon and adjust the level illumination until the blue pixels are just extinguished.

3. From Enterprise main menu, click **Setup**

4. In the pull down menu, click **Shading Correction**

5. Select **Set Shading Correction** in the expanded menu

The shading correction will be stored in objective database. After this point, when an image is captured, the shading correction will be applied to the image. Please note that the use of shading correction will cause a general brightening of the image.

Note: Shading correction will only be active for black and white images. This option will be grayed out when there is a color camera set in the interface.

Clear Shading Correction

To clear shading corrector in objective database:

1. Make sure that the correct objective and camera are selected

2 From Enterprise main menu, click **Setup**

3. In the pull down menu, click **Shading Correction**.

4 Select Clear Shading Correction in the expanded menu

Description of Menus

Please note that many of the drop down menus are context sensitive with regard to their content and other windows that may be open. File is the most notable of these. With the Database view as the active window, the File drop down is as below in Figure 6-1. With the Database view minimized and the Image Window in focus the drop down is as per Figure 6-2.

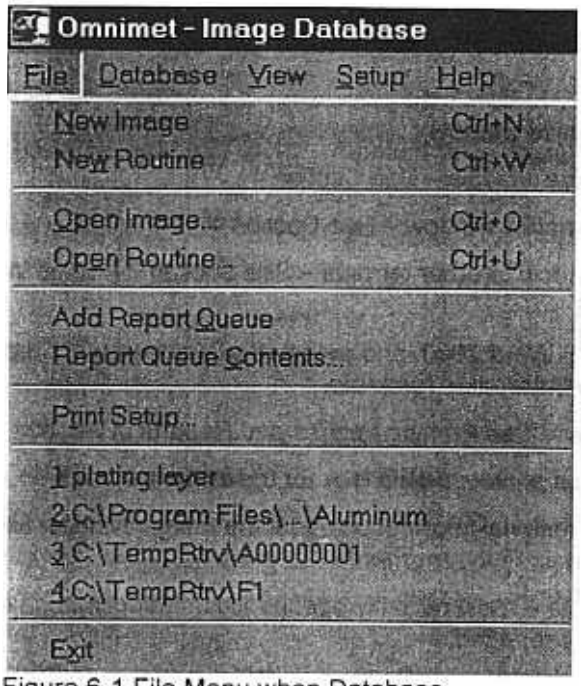


Figure 6-1 File Menu when Database view is active.

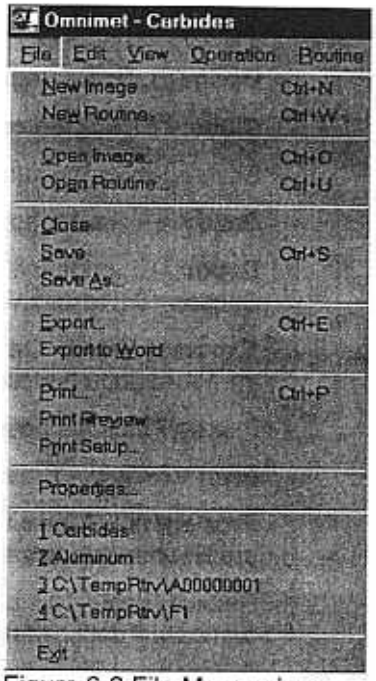


Figure 6-2 File Menu when Image window is active.

The difference is shown above for comparison. A full detail of all the Database dialogs will be given in Chapter 13 for Database view. The rest of this chapter will deal with drop downs and dialogs as they appear when the Database view is minimized and the Image Window is active.

File

New Image – Opens a new image window or clears the current one. See Section 7

New Routine – Opens a new routine window or clears the current routine. See Section 8

Open Image – See Section 4

Open Routine – See Section 4

Close – Closes the currently active window

Save – Saves the currently active window – See Section 4

Save As – Saves the currently active window – See Section 4

Export – Exports the active window to other formats – See Section 7 (Image Window) or Section 10 (Results Window)

Export to Word - Opens up MS Word 2000 and automatically generates a report using the Word 2000 template called Enterprise Template.

Print – Prints the active window – See Printing Images and Reports in Section 4

Print Preview – Previews how a printout would look for the current window

Properties – Allows entry of additional information about the Image Window (Section 7) or the Routine Window (Section 8)

Recent files – This is a list of the 4 most recently opened files. Selecting one of these names will cause that file to be reopened.

Exit – Quits the program

Edit

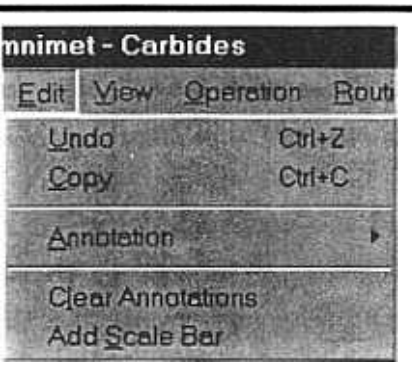


Figure 6-3 Edit Menu

Undo – Removes the effects of the last action

Copy – Makes a copy of the current window or selected part of the image window to the clipboard

Annotation

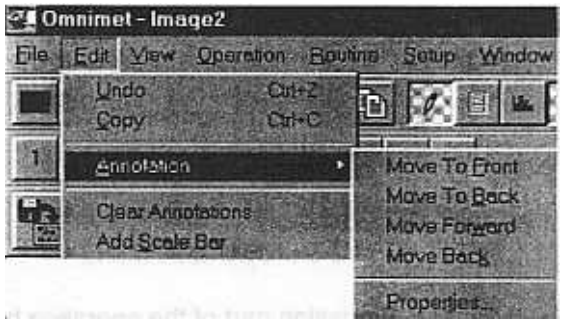


Figure 6-4 Annotation Menu

Move to Front – See Annotations in Section 11 (Image Editing Toolbar)

Move to Back – See Annotations in Section 11 (Image Editing Toolbar)

Move Forward – See Annotations in Section 11 (Image Editing Toolbar)

Move Back – See Annotations in Section 11 (Image Editing Toolbar)

Properties – See Annotations in Section 11 (Image Editing Toolbar)

Clear Annotations – Removes all annotations from the image

Add Scale Bar - If a calibrated image is present in the image window "Add Scale Bar" will superimpose a small scale bar in the bottom righthand corner of the image. This overlay is nondestructive to the image and its properties may be changed as per above. Unit of measure is as per User Preference. Only integers are displayed, no decimal places.

View

Figure 6-5 View Menu

Custom Toolbar – Displays or hides the customizable toolbar

Edit Toolbar – Displays or hides the image editing toolbar

Operation Window – Displays or hides the operation builder part of the routine window

Result Window – Displays or hides the result window

Annotations – Displays or hides all annotations on the image window

Guard Frame – Displays or hides the current guard frame (See Section 9)

Process Frame – Displays or hides the current process frame (See Section 9)

Image Gallery - Displays or hides the database image gallery of thumbnails.

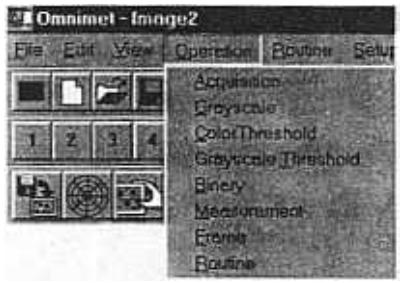


Figure 6-6 Operation Menu

Acquisition – Expands the acquisition part of the operation builder tree in the routine window – See Section 9 for more information

Grayscale – Expands the grayscale part of the operation builder tree in the routine window – See Section 9 for more information

Threshold – Expands the threshold part of the operation builder tree in the routine window – See Section 9 for more information

Binary – Expands the binary part of the operation builder tree in the routine window – See Section 9 for more information

Measurement – Expands the measurement part of the operation builder tree in the routine window – See Section 9 for more information

Frame – Expands the frame part of the operation builder tree in the routine window – See Section 9 for more information

Routine – Expands the routine part of the operation builder tree in the routine window – See Section 9 for more information

Routine

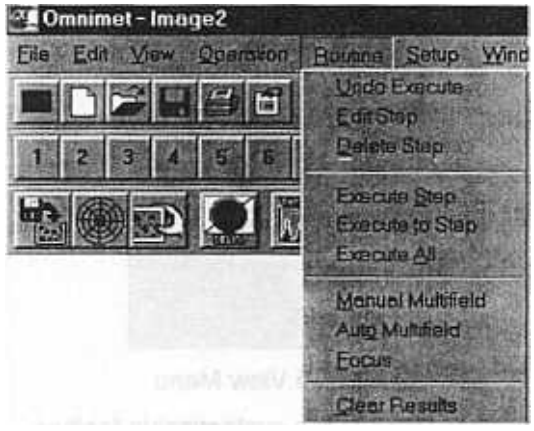


Figure 6-7 Routine Menu

Undo Execute – Removes the effects of the last execute command

Edit Step – Brings up the configuration box for the current step (prior to execution) so parameters can be changed

Delete Step – Deletes the current step

Execute Step – Executes the currently highlighted step. This function is grayed out if the highlighted step does not immediately follow the most recently executed step in the routine.

Execute To – Executes all of the unexecuted steps prior to the step currently highlighted.

Execute All – Executes all of the steps in the routine

Manual Multifield – Allows execution of the routine over a number of fields. The results from the fields can be displayed as a summary or as individual fields.

Auto Multifield – Runs the routine over a series of fields. The automatic stage controller controls the movement of the stage between fields.

Focus – Focuses the image of the sample. This command requires an automatic stage.

Clear Results – Clears the results from the current run of the routine

Setup

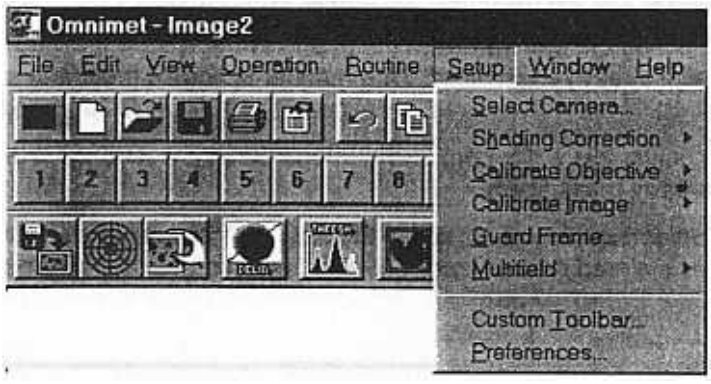


Figure 6-8 Setup Menu

Select Camera – Allows selection of the camera port that will be used for live images. See Section 5 for more information

Shading Correction – Will even out inconsistencies in brightness in the field of view for the current objective selected. See Section 5 for more information.

Calibrate Objective – Allows the user to calibrate the current objective of the microscope. See Section 5 for more information.

Calibrate Image – Allows the user to calibrate the current image. See Section 5 for more information.

Guard Frame – Is active when the Routine window is active. This command brings up the dialog box to setup the Guard Frame for the routine. See Section 8 for more information.

Multifield – Allows configuration of the X, Y pattern that will be used for automatic multifield analysis in conjunction with a motorized stage.

Custom Toolbar – Allows the user to customize the operations toolbar. See Section 12 for more information.

Preferences – Brings up a dialog box to allow customization of the reports and select units. See Section 12 for more information.

Window

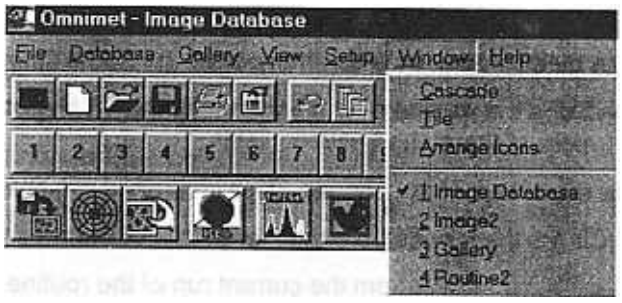


Figure 6-9 Window Menu

Image Database – Selecting this will maximize the Database view dialog if minimized. The check mark indicates if already maximized.

Image2 – Selecting this will maximize the Image Window view if minimized. The check mark indicates if already maximized. The number indicates the image number currently in use.

Gallery – Selecting this will maximize the Image Gallery view if minimized. The check mark indicates if already maximized.

Routine2 – Selecting this will maximize the Routine Window view if minimized. The check mark indicates if already maximized. The number indicates the routine number currently in use.

Help

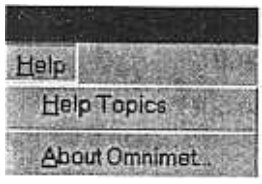
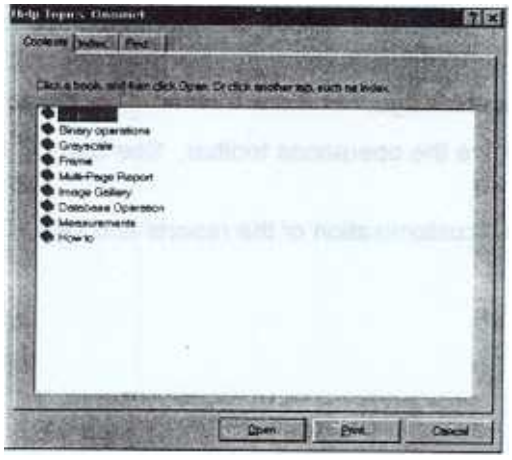
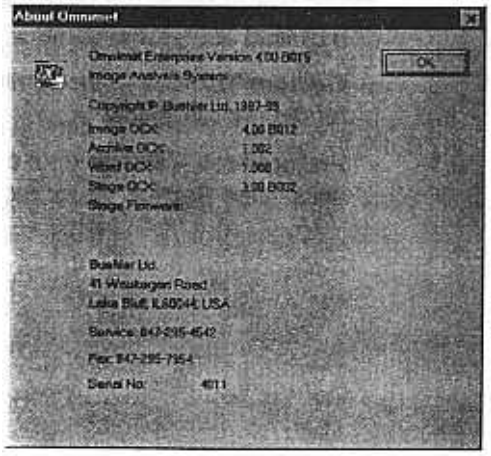


Figure 6-10

Help Topics - Selecting this option will open the Help Topics dialog as seen in Figure 6-11 allowing the user to select a topic of help.

About Omnimet - Selecting this option will open the About Omnimet dialog that gives the information about the Enterprise





system.

Figure 6-11 Help Topics dialog

Figure 6-12 About Omnimet dialog

As noted at the begining of this chapter, the menu's change according to whether the database view is active or not. The following is a description of the menu options available when the database view is active.

File

New Image – Opens an Image Window to accept live video

New Routine – Opens the Routine Operation Builder Window

Open Image – Opens an Open Image dialog

Open Routine – Opens an Open Routine dialog

Add to Report Queue – Sends selected images to the Report Queue

Report Queue Contents – Opens a dialog to show images currently being queued for report generation as seen in Figure 6-13

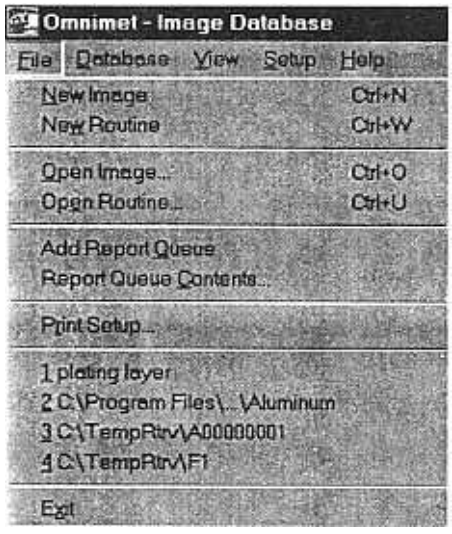


Figure 6-13 File Menu when Database View is active

First Record	Displays the first record.
Previous Record	Moves the view one page back toward the beginning of the record.
Next Record	Moves the view one page forward toward the end of the record.
Last Record	Displays the last page of the record.
Edit Record	Opens the fields that can be edited by the user for necessary changes.
Add Record	Allows the user to add a new record.
Delete record	Deletes a selected record.
Cancel Add / Edit	Closes any open fields.
Copy Record	Copies field values from a selected record.
Paste Record	Inserts a copy of the contents in the Clipboard.
Retrieve Record	Opens a selected record file.
Archive Project	Moves your image files to an external Storage Medium in order to recover disk space on the hard disk for the Image Database.
Dearchive Project	Retransmits archived images data back to your hard disk.

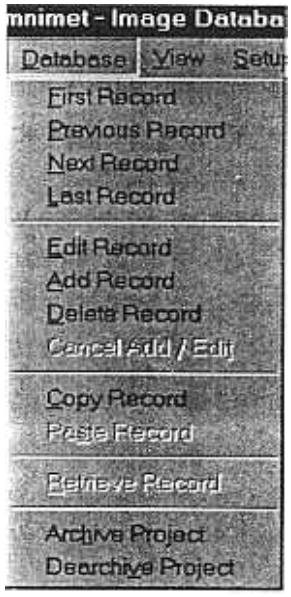


Figure 6-14 Database Menu when Database View is active

View

Custom Toolbar	Allows the user to create a toolbar so that it contains icon buttons for operations or functions that are used frequently.
Image Gallery	Shows all the images of the database or the result of a filter in thumbnail format. It also displays the project number, specimen id, and the image number.
Filters	Shows the filters fo the selected table and the filter being used.

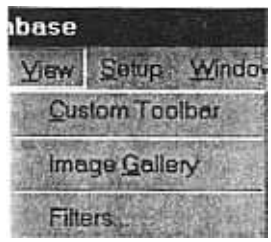


Figure 6-15 View Menu when Database View is active

Setup

Preferences	Brings up a dialog box to allow customization of the select units, reports, annotations, and the database.
Gallery Config	Allows the user to set the amount of rows and columns to be viewed in the Image Gallery Window.

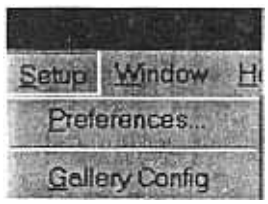


Figure 6-16 Setup Menu when Database View is active

Image Window

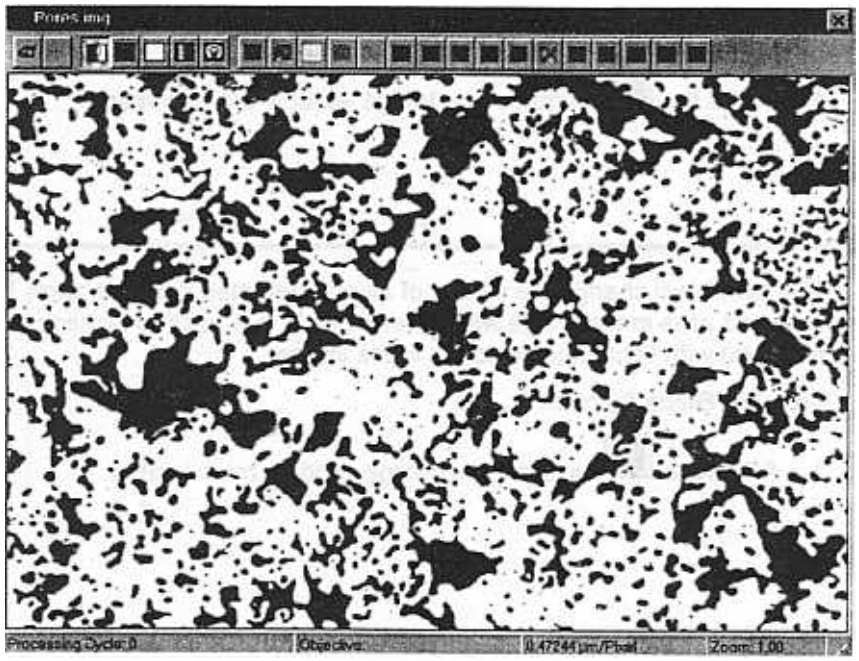


Figure 7-1 Image Window

Start Live Video

To start live video camera:

1 Push in the button in the main toolbar of the Image window.

To stop live video and to capture/freeze image:

1 Release the button in the main toolbar of the Image window.

Note: Per design the image window doesn't allow a frozen image to be resized larger than the actual image.

Add Current Image to Database

This function is only enabled if a project and specimen are open at the image tab level.

1 Ensure that the database is open to Image tab level

2. The button should be active.

3. Press the button to save the image to the Database.

Grayscale

The **grayscale** function displays the gray image in the Image window. To apply the grayscale function:

1. Press the button of the Image window main toolbar.

Black

The **Black** will change the values of all non-detected pixels to zero. Thus, all non-detected area in the image will become black. It is used to highlight the detected phase(s) with light bitplane colors in the image.

To apply **Black** function:

1. Press the button in the Image window main toolbar.

White

The **White** will change the values of all non-detected pixels to 255. Thus, all non-detected area in the image will become white. It is used to highlight the detected phase(s) with dark bitplane colors in the image.

To apply **White** function:

1. Press the button in the main toolbar of the Image window.

Pseudocolor

The **Pseudocolor** allows the user to represent the gray levels with different colors in the image. It is used to indicate any uneven illumination prior to setting the shading corrector. Pseudocolor is disabled for color images.

To apply the **Pseudocolor**:

1. Press the button in the main toolbar of the Image window.

Saturation

The Enterprise uses a 256 gray level range. This extends from 0, which represents black, to 255, which represents white. In order to obtain a good image from the microscope for analysis, the maximum gray value (brightness) of any pixel in the image should not exceed 255. If the gray level of a pixel exceeds 255, it is considered "**overflow**" or **saturation**.

The "**Saturation**" Overflow button allows the user to turn on or off the overflow indicator. Pixels that are over illuminated (grayscale over 255) are colored in bright blue. This is executed in real time so that the user can tune the illumination until the blue pixels of the saturation indicator are just extinguished. In the event that it is desired to work with an image that is in part oversaturated, then the blue saturation pixels will disappear upon image capture.

Note: Saturation only works with monochrome image sources.

To use Saturation:

1. Press the button in the Image window.
2. Adjust the illumination on the microscope until only a few blue overflow indication pixels are visible on the screen.
3. Reduce illumination slightly until no blue pixels are seen.

Bitplanes

The 16 bitplane buttons control the displaying of the colors on the image. Executing a routine will turn on and off the bitplanes as execution continues. To see the appearance of bitplanes that have already been turned off, press the corresponding button to turn it back on.

New Image

To open a new Image window:

1. From the Enterprise main menu, click **File**.
2. Select **New Image** (Ctrl+N).

Or

1 Click the button directly under the File menu.

Open Image

To open an existing image:

1. From the Enterprise main menu, click **File**.
2. Select **Open** in the pull down menu.
3. Navigate to the folder that contains the image to be opened.
4. Click the image file that you'd like to open, and click **Open**.

Or

1. Click the button in the Enterprise's toolbar, and perform step 3, and 4 of the above procedure.

Undo

The button undoes the last user action. One step only.)

Printing an Image

To print out a hard copy of an image:

1. From the Enterprise main menu, click **File**.
2. Select **Print** (Ctrl+P) in the pull down menu.

Or

Click the button in the Enterprise toolbar.

Copy an Image

To copy an image or portion of an image to the Clipboard:

1. From the Enterprise's main menu, click **Edit**.
2. Select **Copy** (Ctrl+C) in the pull down menu.

Or

Press the button in the Enterprise's toolbar.

The copied image can be pasted into other Windows compatible programs.

Save an Image

1. From the main menu, click **File**.
2. Select **Save** (Ctrl+S) or **Save As**.
3. Use **Save As** to save the image to the specified folder with a specific name for the image.
4. Use **Save** to save the image to the original image file. If a new image to be saved, **Save** works exactly the same as **Save As**.

Or

1. Click in the Enterprise toolbar.

Note: The image window must be active to save the image. If the routine window or the results window are active then they will be saved, not the image.

Exporting an Image

To export an image:

1. The Image Window must be the active window (Highlighted title bar) and is frozen.
2. From the Enterprise main menu, click **File**.
3. Select **Export...** in the pull down menu.
4. Navigate to the folder where you'd like to export the image to.
5. Select proper file type.
6. Type in file name with the extension
7. Click **OK**.

Note: Ensure that the image window is active to export the image. If it is the results window that is active then the results will be exported, not the image.

Image Property Window

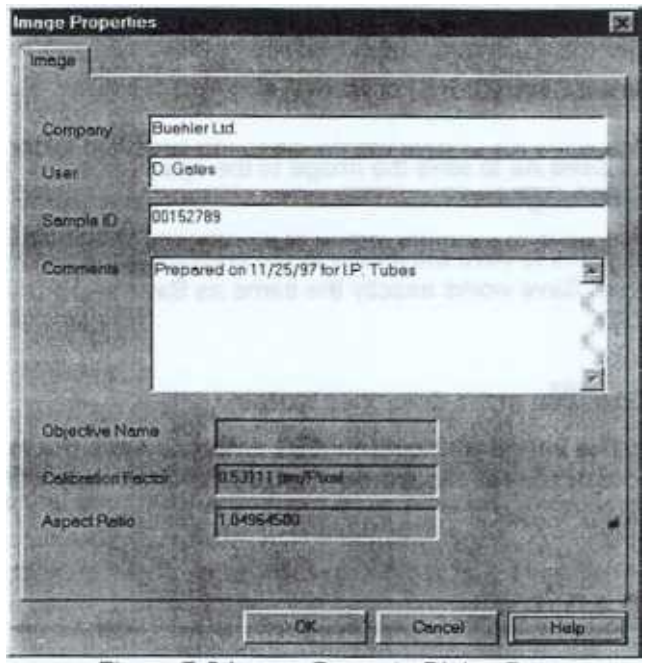


Figure 7-2 Image Property Dialog Box

The Image Property window is where special information is entered to be saved with the image. The information entered on this screen will be used when reports are generated.

To change the image properties:

1. Make sure the Image window is active.
2. From the Enterprise main menu, click **File**
3. Select **Properties...** in the pull down menu or click the button in the Enterprise toolbar.
4. Type in the company name in the **Company** window
5. Type in the user name in the **User** window.
6. Type in the sample id in the **Sample ID** window.
7. Type in comments in the **Comments** window.
8. The **Objective**, **Calibration Factor** and **Aspect Ratio** windows are read only. They display the information for the objective, calibration factor and aspect ratio applied to the image in the Image window.
9. Click **OK** to apply the new properties

Routine Window

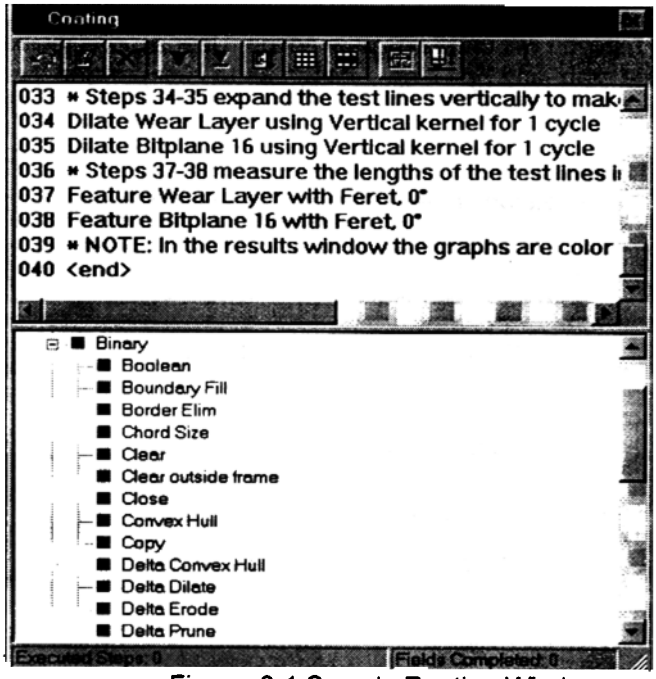

Coating
033 * Steps 34-35 expand the test lines vertically to mak
034 Dilate Wear Layer using Vertical kernel for 1 cycle
035 Dilate Bitplane 16 using Vertical kernel for 1 cycle
036 * Steps 37-38 measure the lengths of the test lines i
037 Feature Wear Layer with Feret, 0°
038 Feature Bitplane 16 with Feret, 0°
039 * NOTE: In the results window the graphs are color
040 <end>
Binary
Boolean
Boundary Fill
Border Elim
Chord Size
Clear
Clear outside frame
Close
Convex Hull
Copy
Delta Convex Hull
Delta Dilate
Delta Erode
Delta Prune

Figure 8-1 Sample Routine Window

A routine is a set of image analysis operations or steps that have been recorded and can be performed on one or more fields of view of the sample. This is a very powerful and important tool in image analysis. The routine can be saved for future use after it is built. Comments associated with individual operations or steps can also be added to help other users understand the routine.

The upper portion of this window is the Routine window. The lower portion is the Operation Builder window. For details on the operations inside the Operation Builder window, refer to Section 9 (Operations) and the Appendix. As can be seen in Figure 8-1, the routine window has a toolbar with the following buttons:

Undo execute

Edit a routine step

Delete a routine step

Execute a routine step

Execute to a routine step

Execute all routine steps

Execute manual multifield

Execute auto multifield

Setup Guard Frame

Execute auto focus

Undo Routine Step

The undo function will undo one user action. User actions include: Execute, Add step, Delete step, and Edit step. After an undo is performed the undo is disabled. Undo will undo the user action on the routine, image and result database.

To undo:

1 Click the button in the Routine window main toolbar.

Edit Routine Step

This function enables the user to edit the routine step and execute the step.

To edit a routine step:

1. Click the step that is to be edited.
2. Click the button in the Routine window main toolbar.

After editing the step, the step will be executed and the next step will be highlighted.

Notice:

1. Whenever the user adds a step from the Operation Builder or the custom toolbar into the routine it will always be added just before the highlighted step.
2. When editing a highlighted step, the **Edit Routine** function will ensure the highlighted step is the next step to be executed in the routine execution sequence. If the step to be edited is not the next step to be executed in the routine sequence, the **Edit Routine** function will execute all of the prior steps, which have not been executed.

Delete Routine Step

To delete a single step from the routine:

1. Highlight the step that is to be deleted.
2. Click the button in the Routine window main toolbar.

Execute Routine Step

This function is used to execute the routine one step at a time. However, this function can only be used to execute the routine sequentially. Otherwise the **Execute Step** button in the Routine window toolbar or the **Execute Step** menu item in the Enterprise main menu will be disabled.

To use Execute Step:

1. Make sure the step selected is the next step to be executed in the Routine execution sequence in the Routine window.
2. From the Enterprise main menu, click **Routine**.
3. Select **Execute Step** in the pull down menu.

Or

Make sure the step selected is the next step to be executed in the Routine execution sequence in the Routine window.

2. Click the button in the Routine window main toolbar.

Repeat the above procedures for the next highlighted step in the Routine window.

Execute Routine to a Step

This function allows you to execute multiple steps in a routine.

To execute multiple steps:

1. Click any step to be executed in the Routine window.
2. From the Enterprise main menu, click **Routine**.
3. Select **Execute to Step** in the pull down menu.
4. All steps above the highlighted one will be executed.

Or

1. Click any step to be executed in the Routine window.
2. Click the button in the Routine window main toolbar.
3. All steps above the highlighted one will be executed.

Execute All Steps in a Routine

To execute all of the steps in a routine:

1. From the Enterprise main menu, click **Routine**.
2. Select **Execute All** in the pull down menu.

Or

1. Click the button in the Routine window main toolbar.

Manual Multifield

This function allows multiple field measurements to be made with the same routine. It stores and displays measurement data, both in total and by individual fields.

To apply the manual multifield function:

1. From the Enterprise main menu, click **Routine**.
2. Select **Manual Multifield** in the pull down menu.
3. The multiple field dialog box pops up in the Routine window.
4. Click the **Start** button to apply the routine to the fields for the first field. Click on the **Continue** button to apply the routine to the remaining fields. The status bar of the Routine window shows how many fields have been measured.
5. Click **Done** button to end the function.

Or

1. Click the button in the Routine window main toolbar.
2. The multiple field dialog box pops up in the Routine window.
3. Click the **Start** button to apply the routine to the fields for the first field. Click on the **Continue** button to apply the routine to the remaining fields. The status bar of the Routine window shows how many fields have been measured.
4. Click **Done** button to end the function.

Note: the function is disabled while image is not live.

Auto Multifield

This function allows multiple field measurements to be made with the same routine automatically. It stores and displays measurement data, both in total and by individual fields. The auto multifield can also be performed by pressing the **RUN** button on the automatic stage controller.

To apply the auto multifield function:

1. From the Enterprise main menu, click **Routine**.
2. Select **Auto Multifield** in the pull down menu.
3. Select **Yes** to clear the results.

Or

1. Click the button in the Routine window main toolbar.

Or

1. Press the **RUN** button on the automatic stage controller.

Note1: When a large stage pattern is set for Auto Multifield, make sure that screen saver and virus scan are disabled before the Auto Multifield is run.

Note2: Auto Multifield can only be accessed when a routine is present and with a live image.

Guard Frame

Guard frame allows you to select smaller field sizes for measurement than the default image window size. It is usually used to build multiple field feature measurement routines without missing or double counting any particles at the edge of the frame.

To set up the Guard Frame:

1. From the Enterprise main menu, click **Setup.** Select **Guard Frame** in the pull down menu.

Or click the button in the Routine window main toolbar.

1. In the frame setup window, you are able to size and position the Guard Frame. For more information about setting the Guard Frame see Section 9.
2. Click **OK** to apply the setting. Click **Cancel** to cancel the setting.

Focus

Focus allows you to focus the image using the automatic stage. The software will adjust the distance between the sample and the microscope objective to find the sharpest image. The auto focus can also be performed by pressing the Auto Focus button on the stage controller box.

To the auto **Focus** function:

1. In the Enterprise main menu, click **Routine**.
2. Select **Focus.**

Or

1. Click the button from the Routine window.

Or

Create a New Routine

To bring up a new Routine window:

1. From the Enterprise main menu, click **File**.
2. Select **New Routine** in the pull down menu.

Or Click in the Enterprise toolbar.

To bring up the Operation window:

1. From the main menu, click **View.**
2. Select **Operation Builder Window** in the pull down menu.

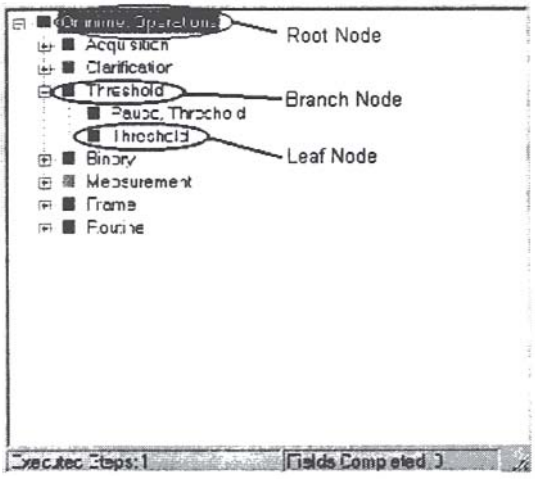


Figure 8-2 Operations Builder

To add operations into the Routine window:

1. In the Operation window, click the **Root Node** to expand the Omnimet Operations.
2. Click any **Branch Node** to expand the branch.
3. For example, click the Branch Node of Threshold, the two functions of "Threshold" and "Pause threshold" will be displayed.
4. Double click the **Threshold** leaf node to bring up the Threshold dialog box.
5. Apply the Threshold operations to the image. For more information about the Threshold dialog, please refer to the help topic for the Threshold.
6. After clicking the **OK** button of the Threshold window, the operation of the Threshold is added to the Routine window.

Or click any button in the custom toolbar to add operations into the Routine window.

Save a Routine

1. From the main menu, click **File**.
2. Select **Save** (Ctrl+S) or **Save As**.
3. Use **Save As** to save the routine to the specified folder with a specific name for the routine.
4. Use **Save** to save the routine to the original routine file. If a new routine to be saved, **Save** works exactly the same as **Save As**.

Or

1 Click in the Enterprise toolbar.

Print a Routine

1. The routine window must be the active window (highlighted title bar)
2. The routine window must not be showing the operation builder.
3. From the Enterprise main menu, click **File**.
4. Select **Print** (Ctrl+P) in the pull down menu.

Or

Click the button in the Enterprise toolbar.

Stopping the Execution of a Routine

In order to stop a routine that is executing, the ESC key should be pressed. If the key is pressed during the execution of commands that involve multiple passes (i.e. thicken and separate), the command will be aborted and execution will stop.

Routine Execution Sequence

All the steps in a routine should be executed sequentially; for example, you are not able to execute the third step without executing the first two steps in a routine

To execute a highlighted step in the Routine window, you need to make sure all of the prior steps must have been executed.

Routine Property Window

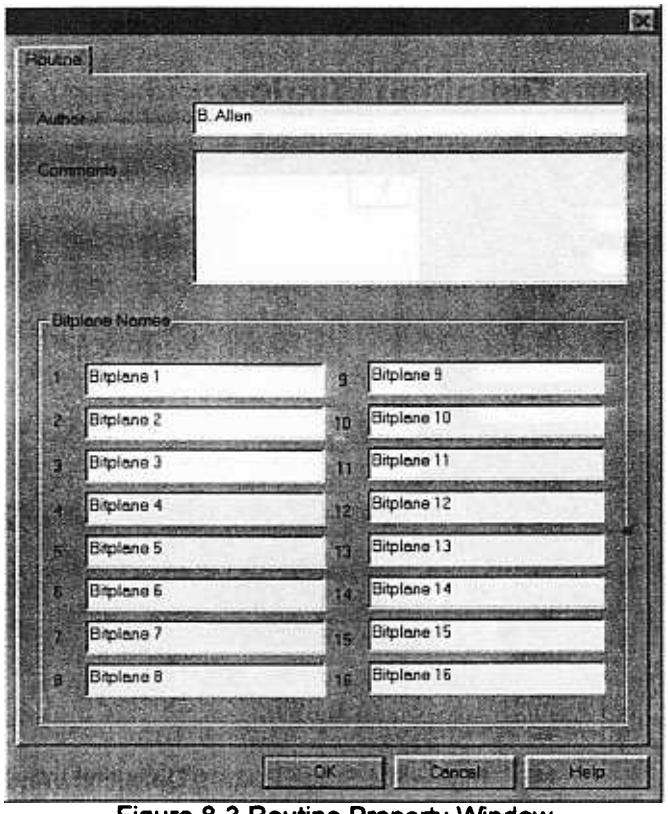


Figure 8-3 Routine Property Window

To open the Routine Property Window, click on **File – Properties** or click on the button when the routine window is active (Highlighted title bar). The information on this screen is saved as part of the routine.

Type in the author name in the **Author** window.

2. Type in the comments for the routine in the **Comments** window.
3. Type in the desired bitplane names in the sixteen bitplane name windows.
4. Click **OK** to apply new properties.

Note: Bitplane 1 corresponds to the leftmost color in the below diagram.

Setup for Auto Multifield

1 From the "Setup" drop down select "Multifield", then select "Stage Pattern"

Stage Pattern Definition Window

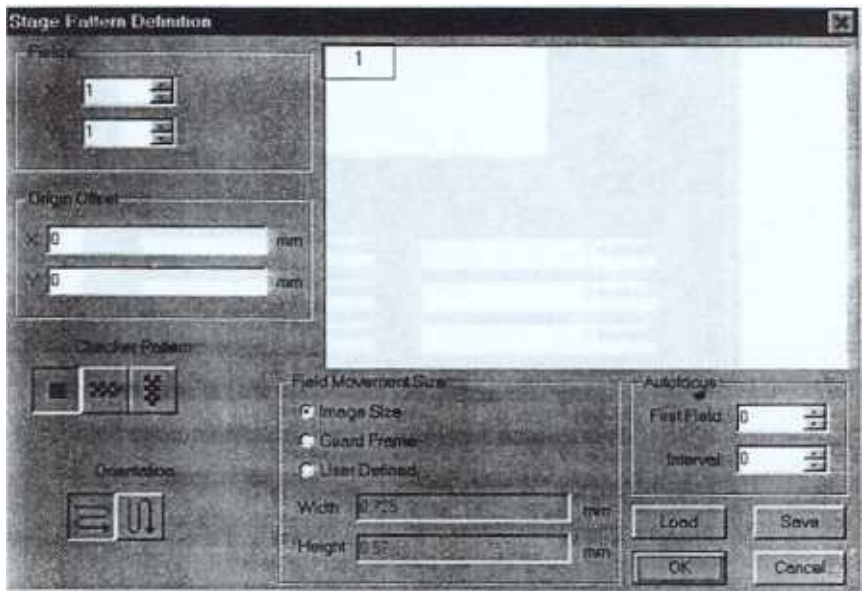


Figure 8-4 Stage Pattern Definition Window

In the above **Stage Pattern Definition** window:

1. In **Fields** group, the number of fields in both X-axis and Y-axis directions may be set. The maximum number in either axis is a total of 10,000 fields.
2. The **Origin Offset** group, allows the settings of an offset point from the set origin point in either or both X-axis and Y-axis.
3. The three **Checker** buttons give the choice of contiguous, vertical checker, or horizontal checker stage patterns to setup the arrangement of fields.
4. The two **Orientation** buttons set the stage's travel pattern in either the X-axis or Y-axis as the preferred direction.
5. In **Field Movement Size** group, you may choose different field size out of the three options: Image **Size, Guard Frame, and User defined**.
6. In **Autofocus** group, the **First Field** allows you to set the first autofocus field. The **Interval** allows you to determine the pattern of autofocus.
7. **The Load** button loads a previously saved pattern file in the Buehler STP format.
8. The **Save** button saves the current stage pattern as a Buehler STP format.
9. Once an auto field pattern has been setup, saving the routine will also save the associated stage pattern.
10. When a saved routine is opened that was saved with an associated stage pattern, that pattern will be available by default as can be observed by viewing the stage pattern window.
11. If the user wants to run a different stage pattern to the default one then either load is used as described in number 7 to load up a saved pattern, or the user

may make a new one from scratch.

For auto multifield **stage pattern** setup:

1. From the Enterprise main toolbar, click **Setup.**
2. Expand the **Multifield** menu item.
3. Select **Stage Pattern**.
4. **Stage Pattern Definition** window will pop up as shown in Figure 8-4 on the prior page.

Auto Multifield Run Options Window

1 From the "Setup" drop down select Multifield then "Run Options".

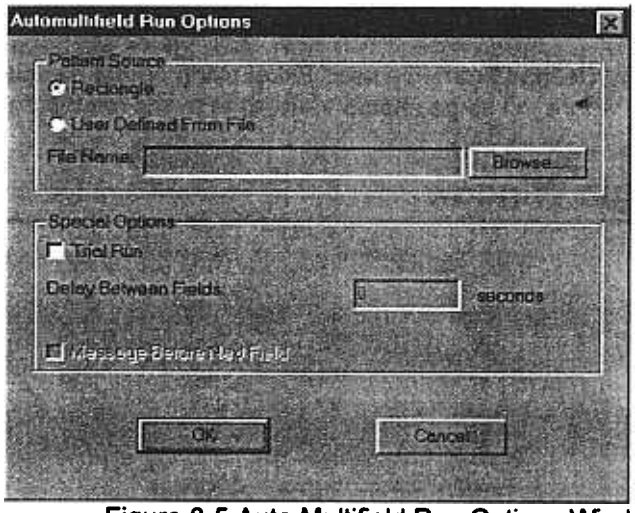


Figure 8-5 Auto Multifield Run Options Window

In the above **Auto Multifield Run Options** window:

1. In **Pattern Source** group, you can choose to use **Rectangle**, which is the default, or a **User Defined From File** as a pattern source.
2. In **Special Options** group, you can choose to enable **Trial Run** option. In this group box, you can also setup the delay time and message between each field.
3. For multifield **Run Option** setup:
4. From the enterprise main toolbar, click **Setup**.
5. Expand the **Multifield** menu item.
6. Select **Run Options**.

   Auto Multifield Run Options window will pop up.

Rectangle

To run a **Rectangle Pattern** that was previously defined:

1. In Enterprise main menu, click **Setup**.
2. Select **Multifield** in the pull down menu.
3. Select **Run Options**.
4. Click on the **Rectangle** input box to set the previously configured field pattern.
5. Click **OK**.
6. In the Routine window, click the button.

User Defined From File

User Defined From File uses Excel.csv (comma delimited) XYZ position tables to set where the stage should travel to in terms of step positions.

Set Origin Window

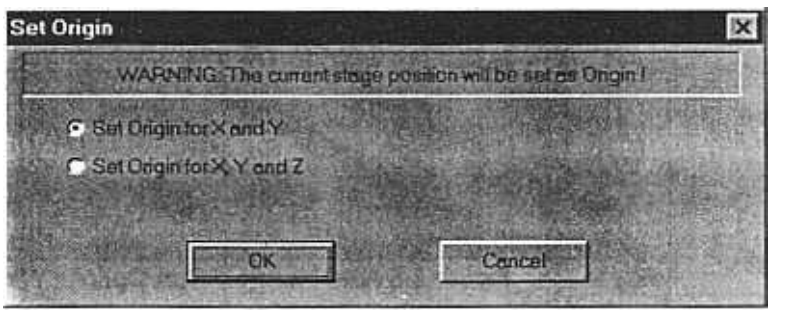


Figure 8-7 Set Origin Window

In the above **Set Origin** option window:

1. **Set Origin for X and Y** performs the same operation as the "Set Origin" button on the stage control joystick. It will cause the current X,Y position to be remembered and the X,Y counter in the status bar of the Enterprise GUI to be zeroed out. The Z-axis reading will be unchanged.
2. **Set Origin for X, Y, and Z** performs the same operation as the "Set origin for X and Y" selection, but additionally zero's out the Z-axis position reading. Subsequent selection of the "Go to Origin" button on the joystick will cause the stage to return to this X,Y position, but not to the zeroed Z position.

Note: When you check any of these options, the Enterprise takes the current stage position as the origin.

Operations

Operations are the building blocks of a routine. Routines will generally include at least one command from each of the following groups: **acquisition**, **grayscale**, **color threshold, grayscale threshold**, **binary**, and **measurement**. Operations are added to a routine by either clicking on the button in the Customizable Toolbar or double-clicking on the operation in the operation builder window.

Displaying Operation Window

To display the **Operation Builder** Window:

1. The Routine window has to be the active window.
2. From the Enterprise main menu, click **View**.
3. Select **Operation Window** in the pull down menu

Acquisition

Average Grab

Average Grab is applied to the input image by taking the average pixel value for each pixel for several frames of live image. The numbers of frames are defined in the "Grab, Average" parameter box as the number of cycles. Since noise is random, the overall S/N ratio is increased and random noise is eliminated. The result is a better quality image for analysis.

To perform **Average Grab**:

1. Double click **Grab, Average** in the Operation Builder window.
2. Choose the number of cycles in the **Grab, Average** window.
3. Click **OK**.

Or

1. Click the button in the Enterprise Custom toolbar.

Note: In order to grab a live image, **Average Grab** should be placed as the first step in a routine. If **Average Grab** is not the first step in a routine, a new image will be grabbed in the middle of execution of the routine, and results may not be repeatable.

Grab

Grab freezes a live image.

To perform **Grab**:

1. Double click **Grab** in the Operation Builder window.

Or

1. Click the button in the Enterprise Custom toolbar.

Note: In order to grab a live image, **Grab** should be placed as the first step in a routine. If **Grab** is not the first step in a routine, a new image will be grabbed in the middle of execution of the routine, and results may not be repeatable.

Load Image

Load image loads the selected image to the image window.

To perform Load Image:

1. Double click **Load Image** in the Operation Builder window.
2. Navigate to the folder that contains the image you'd like to open.
3. Select the image.
4. Click Open button.

Or

1. Click the button in the Enterprise Custom toolbar.

Note: Load Image only work when you use it as the first step in a routine.

Restore Image

Restore Image function brings back the original image. This command is used later in routines when it is desired to view the original grayscale image (prior to any grayscale commands).

To apply **Restore Image**:

1. Double click Restore Image in the Operation Builder window

Or

Click **OK** to apply new properties. Then Click the button in the Enterprise Custom toolbar.

Grayscale

The objective of "**Grayscale**" is to provide a more subjectively pleasing image, improve the usefulness of an image or convert the image to a form that is more suitable to human or machine analysis.

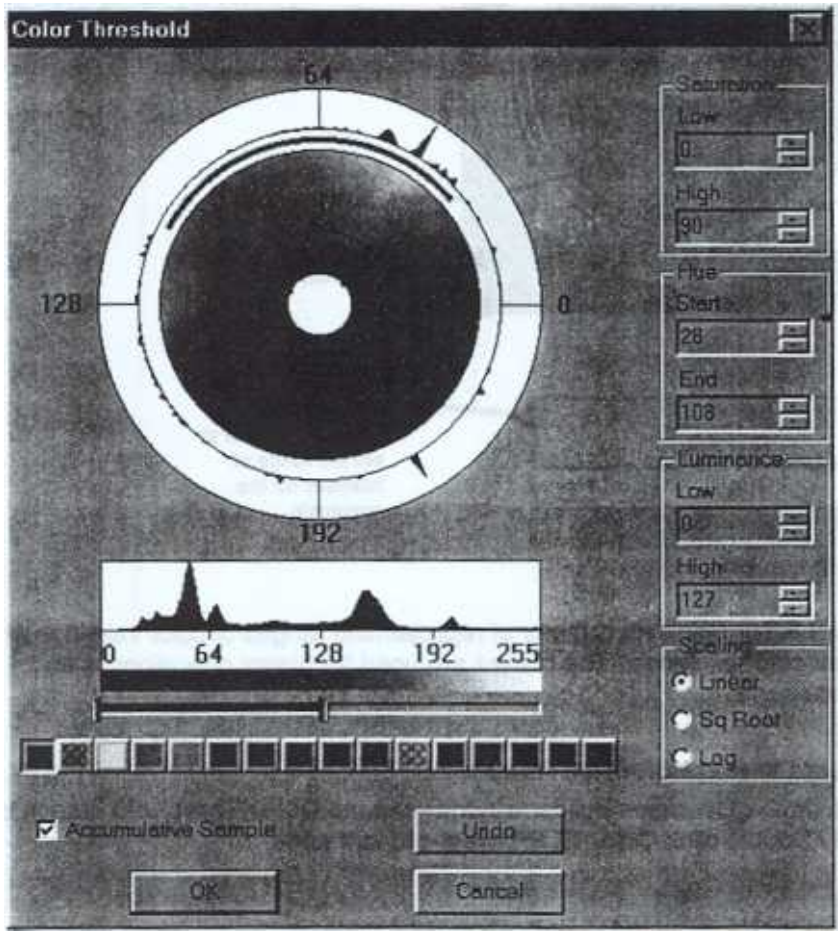
To apply a Gray Operation:

1. In the Operation Builder window, expand the **Grayscale** branch.
2. Double click any one of the leaf nodes.

Or

1. Click on the appropriate icon in the toolbar.

Color HLS Threshold



Saturation is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue and is measured as a percentage from 0%(gray) to 100%(fully saturated). On the color wheel, saturation increases as one approaches the edge of the wheel, and saturation decreases as one approaches the center.

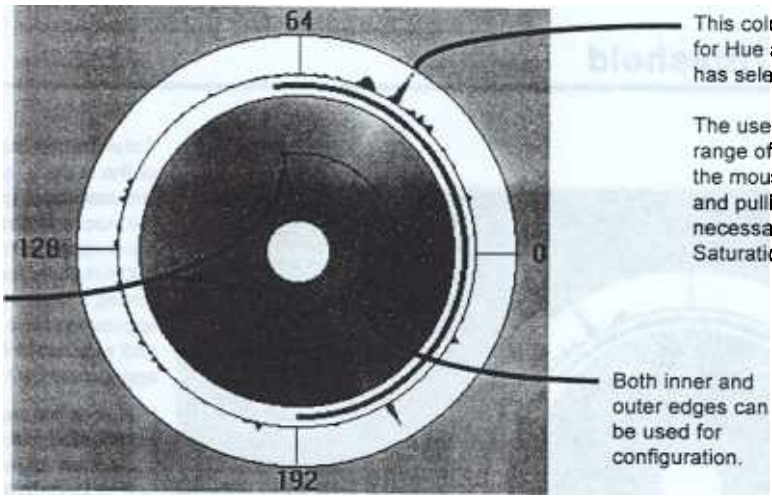
Hue is the wavelength of light reflected from or transmitted through an object. More commonly, hue is identified by the name of the color such as red, orange, or green. Hue is measured as a location on the color wheel and is expressed as a degree between 0° and 360°.

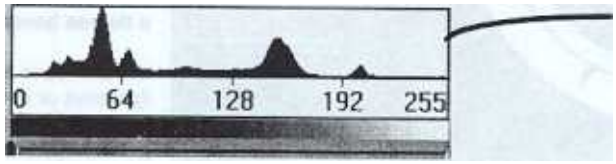
Luminance is the relative lightness or darkness of the color and is usually measured as a percentage from 0%(black) to 100%(white).

Scaling allows the user to choose the way the histogram will be displayed. Linear gives the least detail. Sq. Root gives a more detailed histogram. Lastly, Log gives the maximum detail.

Undo will remove the last accumulative sample selected by the user. It is only active when an accumulative sample is selected.

Accumulative Sample adds a new intensity range to the old range that was originally set.


64
128
0
192
This color wheel displays the range for Hue and Saturation that the user has selected.
The user can also configure the range of Hue and Saturation by using the mouse and clicking on the edges and pulling them until it reaches the necessary ranges for Hue and Saturation.
Both edges can be used for configuration.
Both inner and outer edges can be used for configuration.



Color HLS Thresholding is the way of representing ranges of color values with different color bitplanes. The bitplanes are used for binary operations and measurements.

Two ways to start **Color HLSThreshold**:

1. In the Operation Builder window, expand **Color Threshold** branch node. Double click **Color HLS Threshold** leaf node.

2. Or click in the Enterprise Custom toolbar.

Pause, Color HLS Threshold

Pause, Color HLS Threshold is used to stop execution of a routine until saturation, hue, and luminance thresholding is done. This is useful when there is variance in the color ranges from one image to the next.

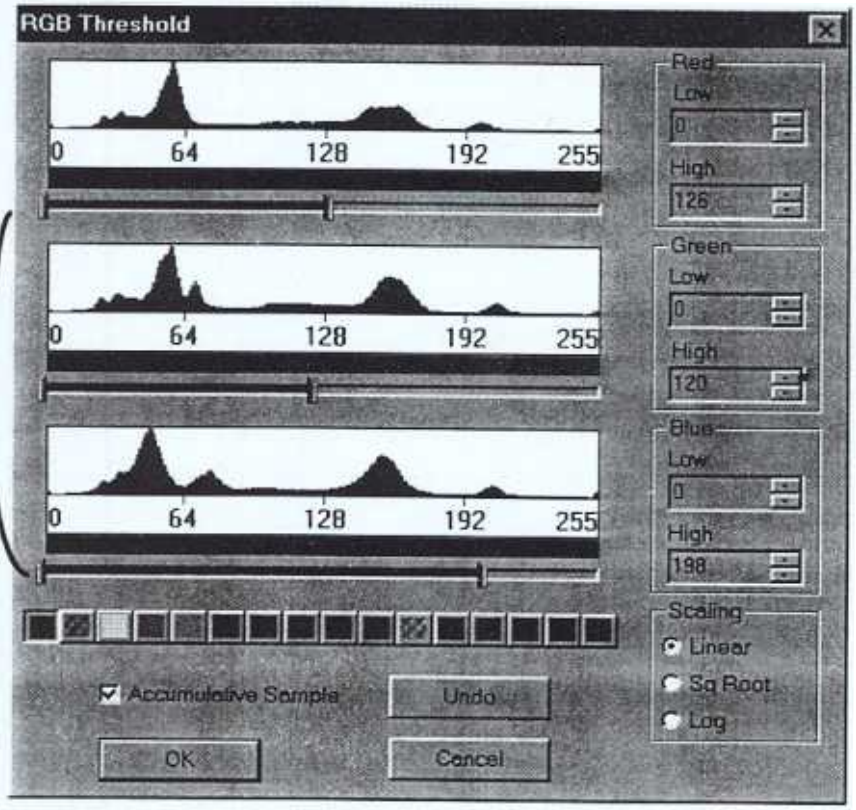
To **Pause, Color HLS Threshold**:

1. In the Operation Builder window, expand **Color Threshold** branch node.
2. Double click on **Pause, Color HLS Threshold**.

Or

Color RGB Threshold

RGB assigns an intensity value to each pixel ranging from 0(black) to 255(white) for each of the RGB components in a color image.



The purposes of the sliding bars are to set the range of intensity for each color.

A bitplane must be selected in order to set the range.

Accumulative Sample adds a new intensity range to the old range that was originally set.

Red enables the user to change the range of intensity for the color red.

Green enables the user to change the range of intensity for the color green.

Blue enables the user to change the range of intensity for the color blue.

Scaling allows the user to choose t way the histogram will be displayed. Linear gives the least detail. Sq. Root gives a more detailed histogram. Lastly, Log gives the maximum detail.

Undo will remove the last accumulative sample selected by the user. It is only active when an accumulative sample is selected.

Color RGB Thresholding is the way of representing ranges of color values with different color bitplanes. The bitplanes are used for binary operations and measurements.

Two ways to start **Color RGB Threshold**:

1. In the Operation Builder window, expand **Color Threshold** branch node. Double click **Color RGB Threshold** leaf node.

2. Or click in the Enterprise Custom toolbar.

Pause, Color RGB Threshold

Pause, Color RGB Threshold is used to stop execution of a routine until red, green, and blue thresholding is done. This is useful when there is variance in the color ranges from one image to the next.

To **Pause, Color RGB Threshold**:

1. In the Operation Builder window, expand **Color Threshold** branch node.
2. Double click on **Pause, Color RGB Threshold**.

Or

1 Click in the Enterprise Custom toolbar.

Grayscale Threshold

Thresholding is the way of representing ranges of grayscale values with different color bitplanes. The bitplanes are used for binary operations and measurements.

Two ways to start **Threshold**:

1. In the Operation Builder window, expand **Grayscale Threshold** branch node. Double click **Threshold** leaf node.
2. Or Click the button in the Enterprise Custom toolbar.

Pause, Threshold

Pause, threshold is used to stop execution of a routine until thresholding is done. This is useful when there is variance in the grayscale ranges from one image to the next.

To **Pause, threshold**:

1. In the Operation Builder window, expand **Grayscale Threshold** branch node
2. Double click on **Pause, threshold**.

Or

1 Click the button in the Enterprise Custom toolbar.

Threshold Window

1 Main thresholding dialog box displays gray scale histogram of the image. Gray scale histogram has X-axis 0-255. Left end of scale is zero (black) and right end is white (255). Y position of the graph represents the number of pixels at each gray level.

2 To detect a bitplane, click one of the bitplane color buttons.

3 Place the cursor over the **Upper Limit** slider. Press and hold the left button of the mouse, and then drag the slider toward right over the desired gray scale range selecting the lightest gray area of intent.

4. Place the cursor over the **Lower Limit** slider. Press and hold the left button of the mouse, and then drag the slider toward right over the desired gray scale range selecting the darkest gray area of intent.

5 If other bitplanes are desired, repeat step 2 through step 4 for detecting the other bitplanes. Clicking on another bitplane will cause the **Lower Limit** slider to be placed immediately to the right of the **Upper Limit** of the last detected bitplane.

6. **Sticky Threshold** option always moves the Lower Limit slider and the Upper Limit slider one video level to the right of the previous position of the Upper Limit slider. Thus, it is guaranteed that different bitplane colors will not overlap, or no video level will be included in more than one bitplane. If 2 bitplanes overlap the color should change to standard olive green overlap color.

7. There are three different Y scalings **Linear**, **Sq. Root** and **Log**. Select the appropriate scale to best view the distribution of the grayscale pixels.

8. Click **Settings** to change or view the numeric value of the 16 bitplanes lower and upper limits.

Threshold Bitplane Setting

In this dialog, numeric **Upper** and **Lower** limits are displayed for each bitplane. You can use the increment or decrement buttons attached to each window to change the **Lower** and **Upper** limits of each bitplane. A value of "-1" means that the bitplane is not being used for thresholding.

Binary Operations

After thresholding, the different phases in the image are represented by different bitplane colors. It is possible that more than one phase or feature of interest was detected by the same bitplane color because of a similar gray level range. A **Binary operation** is the process that separates and classifies features within the same bitplane, based on morphology or size.

To apply a binary operation:

1. In the Operation Builder window, expand the **Binary** branch node.
2. Double click any one of the leaf nodes.

Or

1. From Enterprise's main menu, click **Operation**.
2. Select **Binary** in the pull down menu.

Or

1. Click the appropriate binary operation button in the Enterprise custom toolbar.

For more information about individual binary commands, see the Appendix.

Measurement

After the phases of interest are well detected in different bitplanes, **measurement**, which is the purpose of image analysis, can be accomplished

To apply different type of measurement:

1. Click **Measurement** branch node in the Operation Builder window.
2. Double click any leaf node to apply a specific measurement.

For information about different measurements, please refer to the following topics in the appendix:

Plane area fraction measurement
Sample area fraction measurement
Feature measurement
Field measurement
Field measurement with Criteria
Plane area fraction measurement with Criteria
Sample area fraction measurement with Criteria
Feature measurement with Criteria
Field measurement with Criteria

Process Frame

Process Frame defines a smaller area on the image for some binary operations, such as, clear outside frame, radial grid, square grid, and border elimination.

To setup Process Frame:

1. Expand **Frame** node in the Operation Builder window.
2. Double click **Process** node.

Or

1. Click the button in the Enterprise Custom toolbar.
2. In the frame setup window, you are able to size and position the Process Frame.
3. Click **OK** to apply the setting. Click **Cancel** to cancel the setting.

Guard Frame

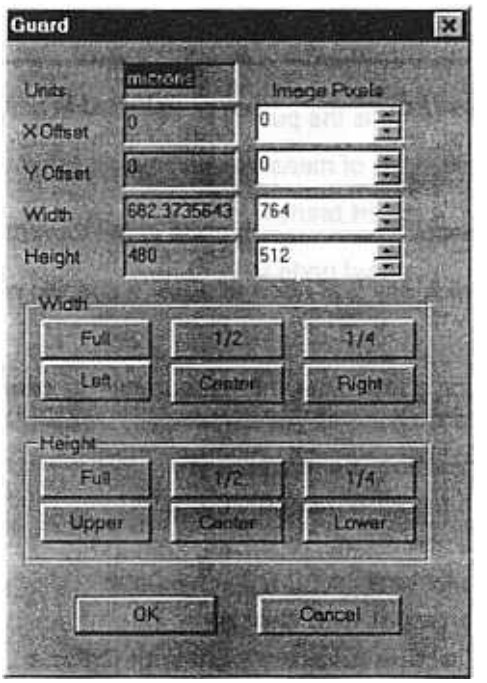


Figure 9-1 Sample Guard Frame setup dialog box

1 There are two groups of buttons in this dialog: **Width** and **Height**.

In the **Width** group:

Full : generates a frame the full width of the image.

½ : generates a frame half the width of the image.

¼ : generates a frame a quarter the width of the image.

Left : moves frame to the left most position in the Image window, so that, the left margin is on the left margin of the Image window. The X offset is 0.

Center : moves frame to the center of the Image window.

Right : moves frame to the right most position in the Image window, so that, the right margin is on the right margin of the Image window.

In the **Height** group:

Full : generates a frame with the image's full height.

½ : generates a frame with the image's half height.

¼ : generates a frame with the image's quarter height.

Upper : moves frame upward, so that, the top margin is on the top margin of the Image window. The Y offset is 0.

Center : moves frame to the center of the Image window.

Lower : moves frame downward, so that, the bottom margin is on the bottom margin of the Image window.

2. You can also change the size and the position of frame manually by the following two methods:

   Moving the cursor to any edge of frame, the cursor changes into a two-direction arrow cursor. Pressing down the left mouse button, and dragging the cursor will change the size of the frame.

   Using the **increment** and the **decrement** buttons of the **Width** and the **Height** windows.

3. Moving frame manually by the following two methods

   Moving the cursor inside frame. Pressing down the left mouse button and dragging the cursor.

   Using the **increment** and the **decrement** buttons of the **X Offset** and the **Y Offset** windows.

4. The **X Offset** and the **Y Offset** windows display the relative distance from the upper left corner of the frame to the upper left corner of the Image window.

5. The **Width** and the **Height** windows display the size of the frame.

6. The **Units** window shows the preferred measurement unit.

7. Click **OK** button to set up the frame. Click **Cancel** the cancel the set up frame function.

Add Comments

1. Expand the **Routine** branch node in the Operation Builder window.
2. Double click **Comment**.

Or Click the button in the Enterprise Custom toolbar.

3. Type in a comment in the edit window. The comment will be displayed in routine.
4. Click **OK**.

Note: Comment lines have no effect on the operation of the routine.

Pause a Routine

To pause a routine in order to undertake manual editing using the image edit toolbar:

1. Expand the **Routine** branch node in the Operation Builder window.
2. Double click **Pause, Edit**.

Or

3. Click the button in the Enterprise Custom toolbar.
4. Type in the comment in the edit window (this step is optional).
5. Click **OK**

In order to continue executing a routine, click **Done** after all of the manual editing is complete.

Save Image

It is sometimes useful to save images for each field analyzed, a "Save Image" step gives this functionality. This function is especially useful with Multifield. When Multifield is running, new image file is saved for every field under an indexed file name.

To run Save Image:

1. Have a suitable routine open, to append with the "Save Image" command.
2. Double click **Save Image** in the Routine Builder window.
3. In the Routine Save Image window, type in the desired file name to the required path.
4. Click **OK**.
5. Run the routine for several fields.
6. At the end of the field run use image open to observe the sequentially stored images under the path that was set in number 4.

Or

1 Click the button in the Enterprise Custom toolbar to observe the list of sequential images.

Clear Annotations

Removes all annotations from the image.

Add Scale Bar

If a calibrated image is present in the image window "Add Scale Bar" will superimpose a small scale bar in the borrom righthand corner of the image. This overlay is nondestructive to the image and its properties may be changed as per above. Unit of measure is as per User Preference. Only integers are displayed, no decimal places.

Result Window

The result window is only available when there is an Image window. The result window is closed when the Image window is closed. When a routine is executed with measurements, the results are stored in a database. After the routine completes execution, the results window is automatically opened and a set of results displayed. When the result window is accessed, the results stored in the database are graphed. The results window can be opened by clicking on **View – Result Window** or by clicking the button in the Enterprise toolbar.

There are two combo boxes in the Result window toolbar. One lists the measurements in the routine and the other one lists the fields that were measured. By clicking on the arrow to the right of the box, the list of options will drop down. Choosing one of the options in the list will cause that graph to be displayed.

On the results toolbar, there are two icons:

Print prints the currently displayed graph shown in the window.

Options pops up the graph options dialog. The graph options are for the currently displayed measurement. If an option in the dialog is not available for a particular measurement, it is disabled (grayed out). Any changes made to the graphs on the options screen will be saved as part of the routine.

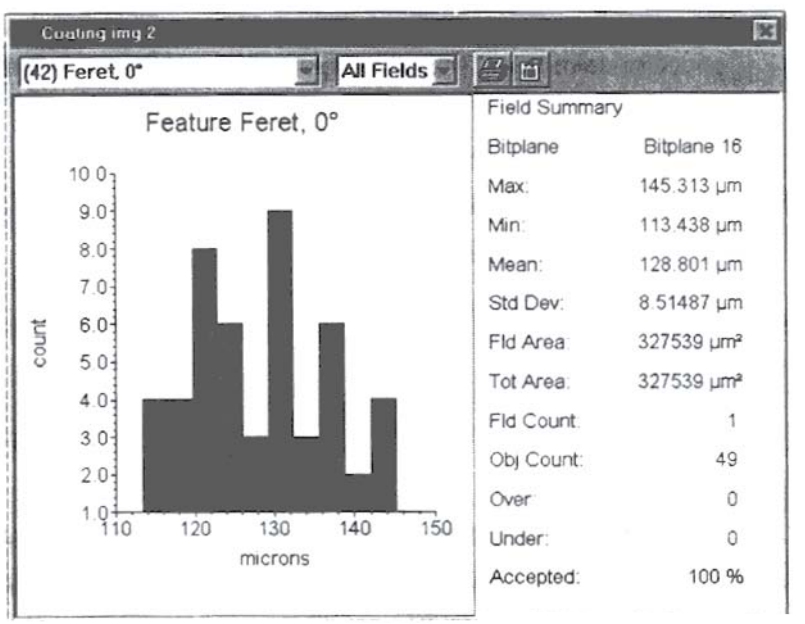


Figure 10–1 Typical results window

Print Report

The graphs can be printed in a report format. The information in the report is drawn from a number of sources. The company and user names are drawn from the image properties. For more formatting options, refer to **Preference** in Section 12.

1. The Result window has to be active.
2. From the Enterprise main menu, click **File**.
3. In the pull down menu, click **Print Preview** to preview document.
4. In the pull down menu, click **Print**.

Copy Result

To copy a result to Clipboard, simply click in the on the Enterprise toolbar. After the results have been copied to the clipboard, they can be use in Microsoft Word 97 by either Pasting the clipboard inside a Text Box or Paste Special as a Picture.

Export Results to Excel

The results of the routine can be exported to an Excel workbook. The results will be formatted as follows:

1. Each step will have its own worksheet.
2. When undertaking multiple fields, feature measures will have a separate sheet for each field. The other types of measurements will have all of the information on one sheet.

The results can be exported by following these steps.

1. The Result window has to be active.
2. From the Enterprise main menu, click **File**.
3. In the pull down menu, click **Export**.
4. Navigate to the desired location.
5. Type a file name, and the file type (XLS).
6. Click **Save**.

Clear Results

After running a routine, the results can be cleared by following these steps.

1. From the Enterprise main menu, click **Routine**.
2. Click **Clear Results** in the pull down menu.

The results will also be cleared when the image goes live or when execution is restarted.

Results Graph Parameter Window

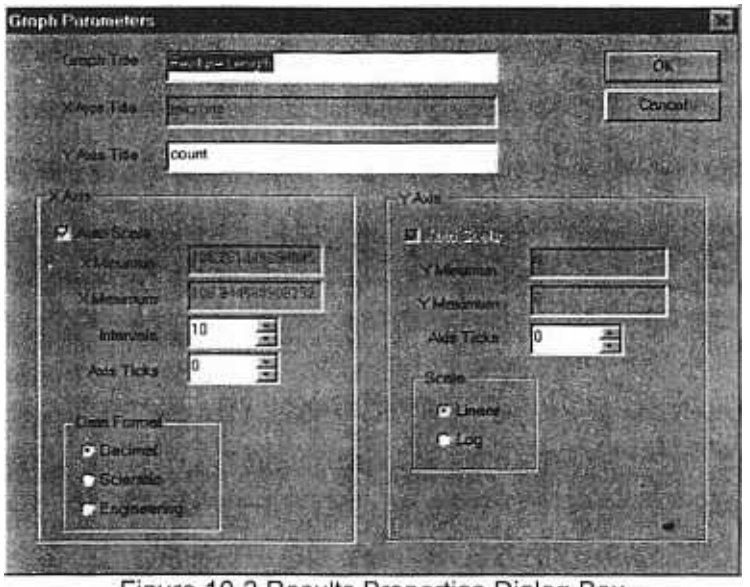


Figure 10-2 Results Properties Dialog Box

Graph Title displays the type of the measurement. The graph title can be changed in this window.

X Axis Title displays the title for the X-axis in the graph. The X axis title can be changed in this window.

Y Axis Title displays the title for the Y-axis in the graph. The Y axis title can be changed in this window.

X Axis group is enabled when displaying the feature measurement graph:

X Minimum and **X Maximum** display the minimum and the maximum ranges for the bins on the X-axis in the graph. Uncheck **Auto Scale** to enable X Minimum and X Maximum.

You can change the values of **Interval** and **Axis Ticks** to generate different graphs.

Three types of different data formats to represent data: **Decimal**, **Scientific**, and **Engineering**.

Y Axis group is enabled when displaying the field measurement graph:

Y Minimum and **Y Maximum** display the minimum and the maximum ranges for the data on the Y-axis in the graph. Uncheck **Auto Scale** to enable Y Minimum and Y Maximum.

You can change **Axis Ticks** to generate different graphs.

Two types of scale: **Linear** and **Log**.

Note: If an option in the dialog is not available for a particular measurement, the option is disabled (grayed out).

Image Editing Toolbar

The Edit toolbar is used to add annotations and make manual adjustments to the image. The Edit toolbar is active only when the Image window is frozen.

Displaying edit toolbar

To display the **Edit Toolbar** on the active window:

1. From the Enterprise main menu, click **View**.
2. Click **Edit Toolbar** in the pull down menu.

Or pushing in the button in the Enterprise toolbar.

Hiding edit toolbar

To hide the **Edit Toolbar**:

1. From the Enterprise main menu, click **View**.
2. Click **Edit Toolbar** in the pull down menu.

Or click the button in the Enterprise toolbar.

Edit toolbar buttons

Selection: allows you to select a section of the image for copying to the clipboard

Free Hand Draw: allows you to draw any shape or pattern with the selected bitplane color by holding the left button of the mouse and drawing

Line Draw: allows you to draw a straight line with the selected bitplane color by clicking and dragging

Area Fill: allows you to paint a selected and bounded area

Draw & Fill: allows you to draw the outline of a pattern and fill it with the selected bitplane color.

Erase: allows you to erase a pixel wide line of the selected bitplane color.

Erase: allows you to erase an 8 pixel wide line of the selected bitplane color.

Delete: allows you to delete any annotations or drawings in the selected bitplane.

bitplanes: allows you to choose color for editing.

A detailed description of the functions below is provided in the following text.

Text Annotation:

Point to Point Measure:

Curvilinear Measure:

Angle Measure:

Line Scan Histogram:

Hand: Pan

Zooming In

Zooming Out

Annotation Text

To put annotation text in the Image window:

1. Click the button of **Edit** toolbar.
2. Move the mouse pointer to a desired position on an image.
3. Press down the left mouse button.
4. Drag the mouse pointer to distance the annotation from the feature being described (this is optional).
5. Release the left mouse button.
6. Move the mouse pointer inside the text-displaying window.
7. Double click the left mouse button.
8. In the popup **Properties** dialog, select **Text** property.
9. Type in new text.
10. Click **OK**.

Pt to Pt Measure

A point to point measure is used to measure the straight line distance between two points in the image.

To make a **Pt to Pt measure**:

1. Click the button in the **Edit** toolbar.
2. Move the mouse pointer to a desired position in the image.
3. Press and hold down the left mouse button, and drag the mouse pointer to the other end.
4. Release the left mouse button.
5. The distance will be displayed with the selected measured unit.

Curvilinear Measure

A curvilinear measure is primarily used to measure the distance around an object or along a curved path.

To perform a **Curvilinear measure**:

1. Click the button in the **Edit** toolbar.
2. Move the mouse pointer to a desired position in the image.
3. Press and hold down the left mouse button, and drag the mouse pointer to the other end.
4. Release the left mouse button.
5. The distance will be displayed with the selected measurement unit.

Angle Measure

1. Click the button in the **Edit** toolbar.
2. Move the mouse pointer to a desired position on an image.
3. Press and hold down the left mouse button, and drag the mouse pointer to another position.
4. Release the left mouse button.
5. Press and hold down the left mouse button and drag the mouse pointer to another point.
6. Release the left mouse button.
7. The angle made up by these two lines will be displayed.

Line Scan Histogram

Line Scan Histogram allows you to obtain a graylevel histogram across a line on the image in any direction.

1. Click the button in the **Edit** toolbar.
2. Move the mouse pointer to a desired position on an image.
3. Press and hold down the left mouse button, and drag the mouse pointer to another point.
4. Release the left mouse button.
5. The histogram corresponding to the line on the image will be displayed.

Pan

1. Click the button of the Edit toolbar.
2. Move the mouse pointer inside the image. The mouse pointer becomes a hand inside the image.
3. Press and hold down the left mouse button and move the image.

Zoom

1. Click the button of the Edit toolbar to zoom in.
2. Click the button of the Edit toolbar to zoom out.

Change Annotation Property

To change the properties of annotation:

1. Click **Edit** from the Enterprise's main menu
2. Select **Annotation** in the pull down menu.
3. Select **Properties**

Or

1. Move the mouse pointer to the annotation text where a change of properties is desired.
2. Click the left mouse button to select the text.
3. Click the right mouse button to reveal a pull down list.
4. Select **Annotation Properties** in the popup menu.

There are 4 properties: **Text**, **Background**, **Border** and **Line**.

Text:

In text window, you can change the text to be displayed on the Image window.

Note: You have to select Disable AutoUpdate option in order to display the new text.

Disable AutoUpdate option lets you enable or disable automatic screen update. For example, if you enable autoupdate and change the measurement unit from thousandths of an inch to microns, the annotation text will be update automatically.

Click **Color** to change text color.

Background:

- **Transparent** option allows you to switch text background between transparent and solid color.

Click **Color** to change text background color.

Border:

Width changes the border width surrounding annotation text.

Click **Color** to change of border.

No Border option allows you to turn on/off text border.

Line:

Width changes the line width

Click **Color** to change line color

Move to Front

Used in cases where several annotations overlay each other, for example, annotation 1 is on the top of annotation 2 and annotation 2 is on the top of annotation 3.

To move annotation 3 to the front of all the annotations (thus, annotation 3 is on the top of annotation 1):

1. Move the mouse pointer to the annotation 3 text, and click the left mouse button.

2 Click the right mouse button

3 In the popup menu, select **Move to Front**.

Or

1. Move the mouse pointer to the annotation 3 text, and click the left mouse button.

   Click **Edit** in the Enterprise main menu.

3. Select **Annotation** in the pull down menu.

4 Select **Move to Front**

Move to Back

Used in cases where several annotations overlay each other, for example, annotation 1 is on the top of annotation 2 and annotation 2 is on the top of annotation 3.

To move annotation 1 behind all the annotations (thus, annotation 1 is behind annotation 3):

1. Move the mouse pointer to the annotation 1 text, and click the left mouse button.

2. Click the right mouse button.

3. In the popup menu, select **Move to Back**.

Or

1. Move the mouse pointer to the annotation 1 text, and click the left mouse button.

2. Click **Edit** in the Enterprise main menu

3. Select **Annotation** in the pull down menu.

4 Select **Move to Back**.

Move Forward

Used in cases where several annotations overlay each other, **Move Forward** moves the selected annotation one level up. For example, annotation 1 is on the top of annotation 2 and annotation 2 is on the top of annotation 3.

To move annotation 3 to the front of annotation 2 (thus, annotation 3 is on the top of annotation 2):

1. Move the mouse pointer to the annotation 3 text, and click the left mouse button.
2. Click the right mouse button.
3. In the popup menu, select **Move Forward**.

Or

1. Move the mouse pointer to the annotation 3 text, and click the left mouse button.
2. Click **Edit** in the Enterprise main menu.
3. Select **Annotation** in the pull down menu.
4. Select **Move Forward**.

Move Back

Used in cases where several annotations overlay each other, **Move Back** moves the selected annotation one level down. For example, annotation 1 is on the top of annotation 2 and annotation 2 is on the top of annotation 3.

To move annotation 1 behind annotation 2:

1. Move the mouse pointer to the annotation 1 text, and click the left mouse button.
2. Click the right mouse button.
3. In the popup menu, select **Move Back**.

Or

1. Move the mouse pointer to the annotation 1 text, and click the left mouse button.
2. Click **Edit** in the Enterprise's main menu.
3. Select **Annotation** in the pull down menu.
4. Select **Move Back**.

Undo Edit

To undo the last editing action:

1. From the Enterprise main menu, click **Edit**.
2. Select **Undo** in the pull down menu.

Or click the button in the Enterprise toolbar.

Copy Annotation

To copy an annotation to the Clipboard:

1. Click the button of **Edit** toolbar
2. Move the mouse pointer to the annotation to be copied
3. Push and hold down the left mouse button and drag the mouse button to make a rectangle to surround the annotation to be copied. After the rectangle covers the desired annotation, release the left mouse button.

There are 3 ways to copy

1. From the Enterprise main menu, click **Edit**. In the pull down menu, select **Copy**.
2. Click the button in the Enterprise toolbar.
3. Click the right mouse button. In the popup menu, select **Copy**.

Clear Annotations

To clear annotations:

1. From Enterprise main menu, select **Edit**.
2. Select **Clear annotations** in the pull down menu.

Add Scale Bar

With Image Window as current selection click on the Edit drop down

1. Click on Add Scale Bar to add a scale non-destructively over a calibrated image.
2. If no longer needed use clear annotation to remove.

Custom Toolbar

The custom toolbar is used to quickly access the functions that are used most often. Clicking on one of the buttons in the toolbar will cause the routine dialog box to be displayed.

Displaying Custom Toolbar

To display the **Custom Toolbar** on the active window:

From the Enterprise main menu, click **View**.

2. Click **Custom Toolbar** in the pull down menu

Hiding Custom Toolbar

To hide the Custom Toolbar:

1. From the Enterprise main menu, click **View**.
2. Click **Custom Toolbar** in the pull down menu.

Customize Toolbar Window

Available buttons list box displays all the buttons available on the Custom Toolbar.

Toolbar buttons list box displays all the buttons currently on the Custom Toolbar.

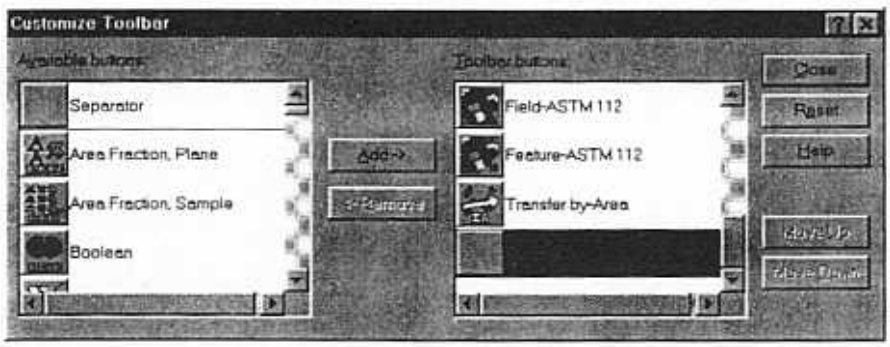


Figure 12-1 Customize Toolbar Dialog Box

Add new buttons:

1. In the **Toolbar buttons** list box, select the button that will follow the new button about to be added.
2. In the **Available buttons** list box, click on the button that will be to added the Custom Toolbar.
3. Press **Add** button.

Note: A total of 29 buttons can be added to the Custom toolbar.

Remove a button:

1 In the **Toolbar buttons** list box, click on the button that will be removed.

2. Press **Remove** button. The button will be listed in the **Available buttons** box.

Move a button:

1 In the **Toolbar buttons** list box, click on the button to be moved.

2. Click either **Move Up** or **Move Down**.

Units:

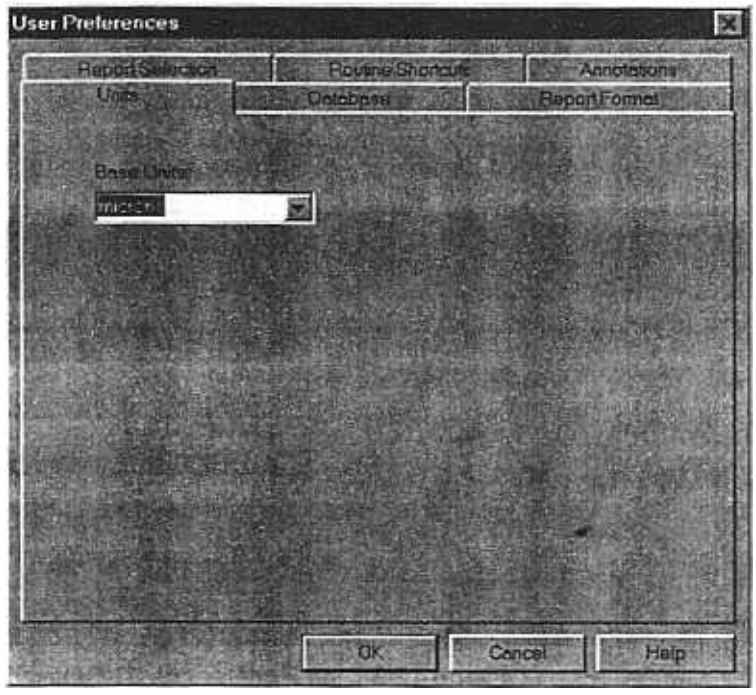


Figure 12-2 User Preferences (Units Dialog Box)

To access the setup dialog box for User Preferences, go to **Setup – Preferences**. The Units tab is used to select the measurement units for results. The choices are pixels, inches, thousandths of an inch, microns, millimeters, and centimeters. When the unit is changed, the graphs in the results window will be updated to reflect the new unit.

Database:

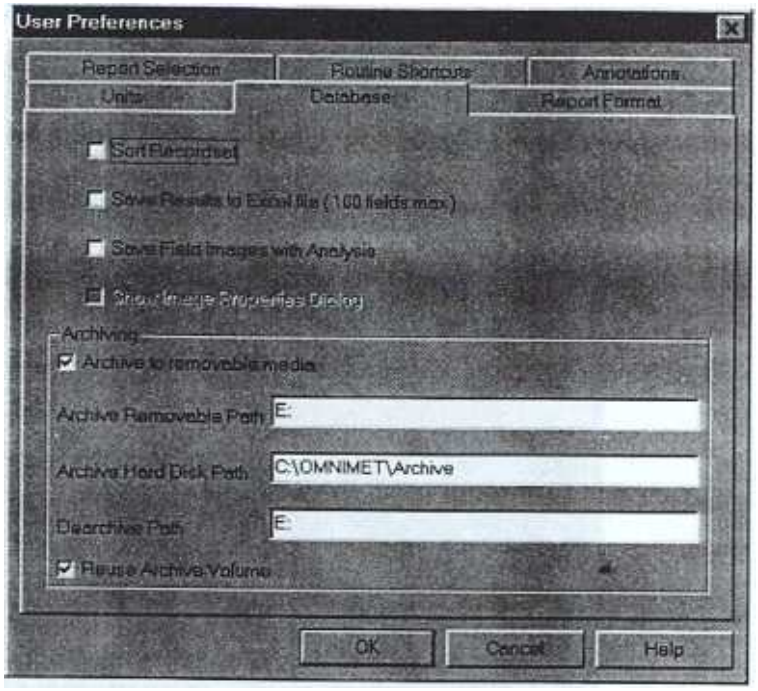


Figure 12-3 User Preferences (Database Dialog Box)

The Database tab controls the settings of the database functions. The following are the list of functions found in the Database tab and their descriptions:

Sort Recordset:	Check this box if you wish all the records in the database are sorted by their key value.
Save Results to Excel file: (100 fields max)	Check this box if you wish to save the analysis result to Excel files.
Save Field Images for Analysis:	Check this box if you want to save images for the analysis.
Show Image Properties Dialog:	Check this box if you want the Enterprise to show the image property before an image is saved for analysis.
Archive to removable media:	Check this box if you want to archive images to removable media.
Archive Removable Path:	You can specify the path for the removable media drive in this box.
Archive Hard Disk Path:	You can specify the archive hard disk path. This is the directory where the database saves all the information.
Dearchive Path:	You can specify the de-archive path in this box.
Reuse Archive Volume:	Check this box if you wish to delete the archive volume after you de-archive the media.

Report Format:

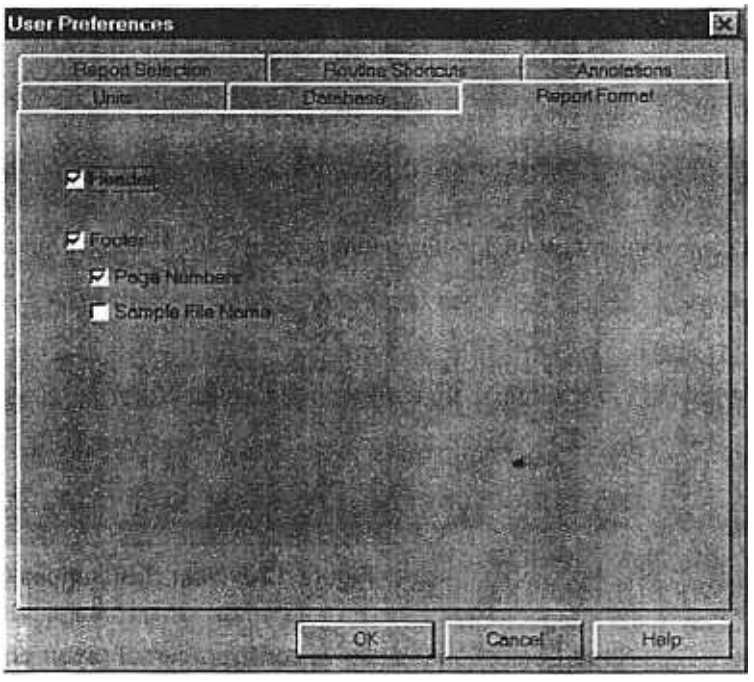


Figure 12-4 User Preference (Report Format Dialog Box)

The Report Format Options tab controls the format of the reports when printing results. The Header box turns on the printing of a header at the top of each page. The header consists of items such as the sample name, date, and comments. The Footer when turned on will print the options (Page Numbers and Sample File Names) at the bottom of each page.

Report Selection:

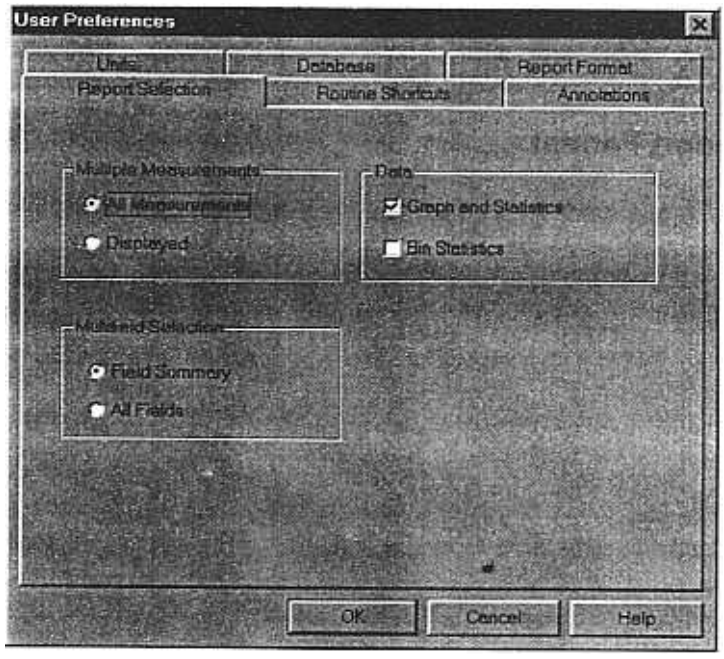


Figure 12-5 User Preferences (Report Selection Dialog Box)

The Report Selection tab allows configuration of report printouts.

In Multiple Measurements group:
All Measurements prints all measurements.

Displayed prints only the measurement results currently displayed in the active results window.

In **Data** group:

Graph and Statistics prints both graphs and statistical data in the report.

Measured Value prints the measured data in the report.

In **Multifield** Selection:

Field Summary prints out a summary report.

All Fields prints out an individual report for each field.

Routine Shortcuts:

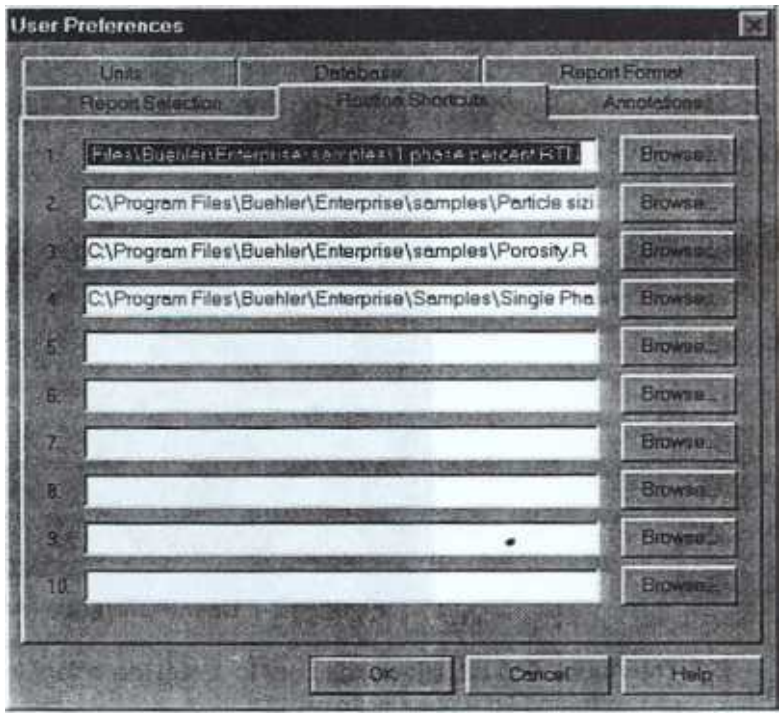


Figure 12-6 User Preferences (Routine Shortcuts Dialog Box)

The Routine Shortcuts tab allows the user to select a maximum of ten shortcut paths to link the selected routine files to the numbered toolbar for fast access to the users favorite routines. Use "Browse" to set the path to other files as required.

Annotations:

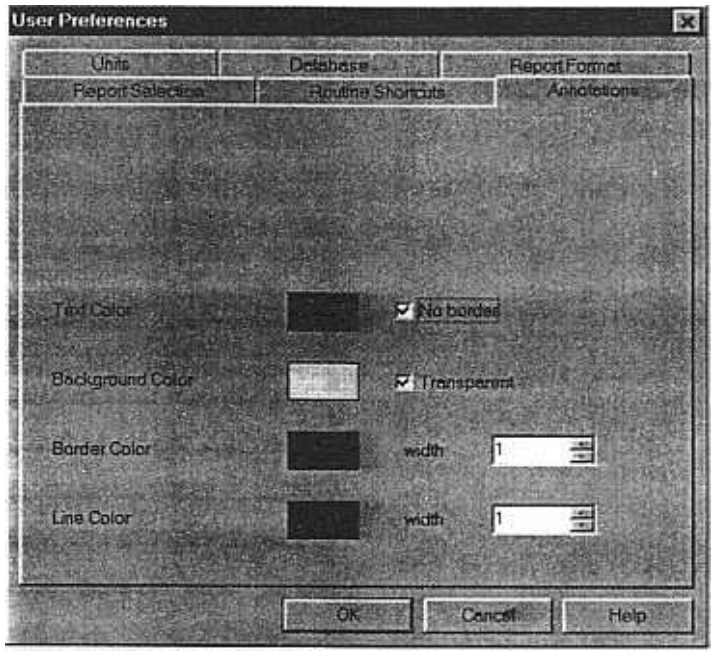


Figure 12-7 User Preference (Annotations Dialog Box)

The Annotation tab allows the user to select the colors for the Text, Background, Border & its width, and Line color & its width.

Text Color changes the color for the text in a annotation. To do this you click the color box to bring up the color selection window and choose the preferred color.

Background Color changes the background color in an annotation. To do this you click the color box to bring up the color selection window and choose the preferred color.

Border Color changes the border color in an annotation. To do this you click the color box to bring up the color selection window and choose the preferred color.

Line Color changes the line color in an annotation. To do this you click the color box to bring up the color selection window and choose the preferred color.

Width changes the width for the border and/or line in an annotation. To do this you use the spin boxes to change the widths of the border and line.

Changing the Routines associated with the Shortcut icons

If it is required to reassign the shortcut icons to other routines than the ones linked as default, then the following steps should be followed.

1 In the "User Preferences" click on the Browse button of the numbered icon that is to be changed. This will open a standard "Open" dialog.
2 Use the windows "Open" dialog to navigate to the routine filename that is now to be associated with the shortcut.
3 Close the "Open" dialog window with OK.
4 Close the "User Preferences" dialog with OK.
5 Check that the shortcut path has been reassigned by letting the mouse pointer hover over the shortcut icon so that the tooltip reveals the path and filename.

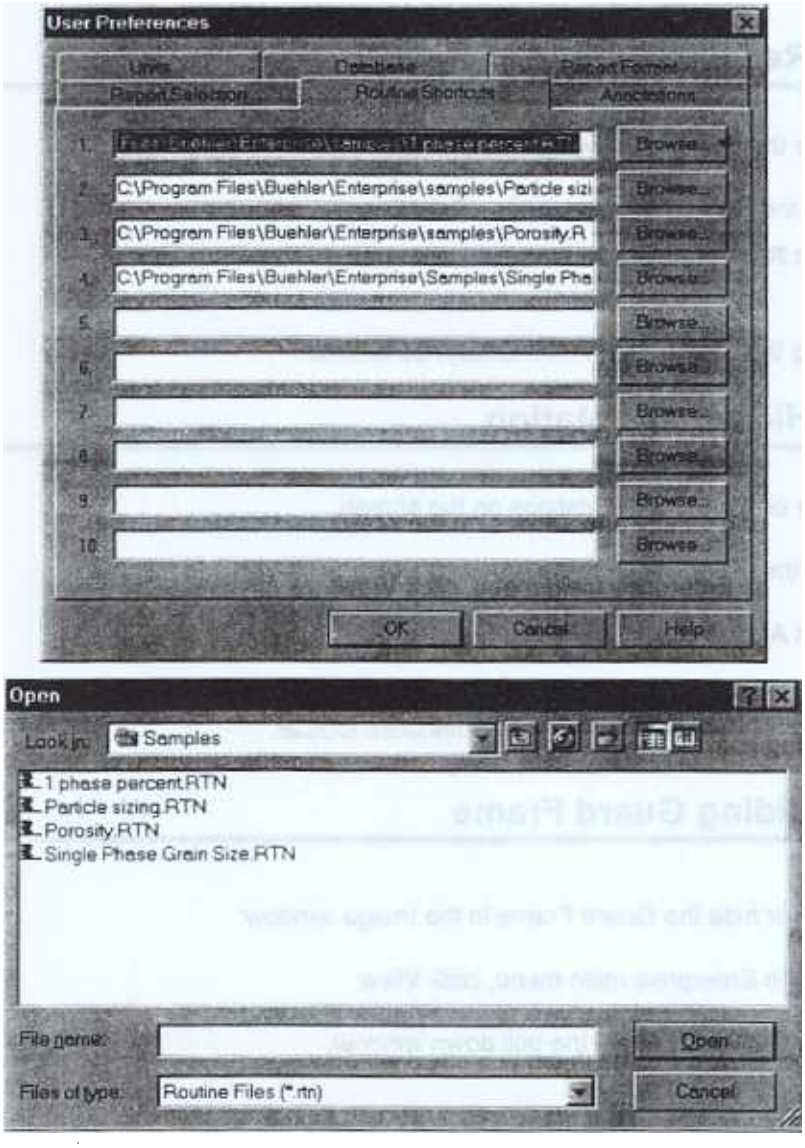


Figure 12-6 Open dialog box from the User Preferences when browse is selected

Standard Toolbar

This toolbar is always displayed as part of the Omnimet Enterprise frame.

Displaying Routine Window

If the routine is minimized, you can click the button in the Enterprise toolbar to display the Routine window.

Displaying Result Window

To display the Result window

1 From the Enterprise main menu, click **View**.

2. Select **Result Window** in the pull down menu.

Or clicking the button in the Enterprise toolbar

Displaying/Hiding Annotation

To display or hide any annotations on the screen

1 From the Enterprise main menu, click **View**

2 Select **Annotation** in the pull down window.

Or pushing in the button in the Enterprise toolbar.

Displaying/Hiding Guard Frame

To display or hide the Guard Frame in the Image window:

1 From the Enterprise main menu, click **View**

2 Select **Guard Frame** in the pull down window.

Or simply push in the (red) button in the Enterprise toolbar.

Displaying/Hiding Process Frame

To display or hide the Process Frame in the Image window:

1. From the Enterprise main menu, click **View**.
2. Select **Process Frame** in the pull down window.

Or simply push in the (blue) button in the Enterprise toolbar.

Using Process Frame And Guard Frame With A Live Image

While both the Guard Frame and/or the Process frame may be displayed against a frozen image as detailed in the prior sections. To display them against a live Image the following steps will need to be undertaken:

Click on the Saturation icon while the image is live.

From the Enterprise main menu, click **View**.

Select either or both the **Process Frame** or **Guard Frame** as needed in the pull down window or use the relevant icons.

Shortcut Toolbar

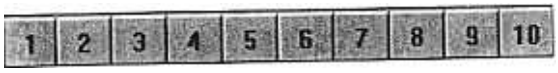


Figure 12-6 Routine Shortcuts toolbar

Icon 1 - 1 phase percent
Icon 2 - Particle sizing
Icon 3 - Porosity
Icon 4 - Single Phase Grain Size

The shortcut toolbar provides the user with the ability to quickly access up to 10 of the most commonly used routines. Each Enterprise is shipped with 4 of these buttons preset to supplied routines and images as described below. Eight other routines and images are also provided, but not attached. To attach them, follow the instructions given on page 12-9.

1. Button 1 demonstrates phase detection in color. Area phase percentage is then given.
2. Button 2 is an example of particle sizing.
3. Button 3 is an example of porosity.
4. Button 4 is an example of single phase grain sizing.

The file name and path used for each of the previous buttons is given with the tooltip if the mouse pointer is allowed to hover over any of the buttons.

The user may reassign any of the 10 shortcut buttons to any other desired routine file at any time using the "User Preference" routine shortcuts dialog.

Using the Shortcut Toolbar

If it is not known which of the numbered icons will access the application solution that is needed, simply allow the mouse pointer to hover momentarily on each icon to reveal the routine name via the tooltip wizard.

2. Click on the appropriate icon to instantly load the required application solution routine to the routine window.

3. To see the application of the routine on the supplied stored image, click on the button in the routine window.

4. To use the shortcut routine on your own material simply highlight the step that calls for the stored image and use button to delete that step. The routine will now work with the live image. Edit all remaining steps as need to accommodate differences between the live image and the stored standard. If required, save the modified routine with a new filename. The modified routine may be attached to a shortcut icon as described on page 12-4.

Using and Modifying the supplied shortcut application solutions

The routines that are linked to the shortcut icons are designed to demonstrate a range of common application solutions. The user is free to modify any of these routines, but they must be saved with a new name since the supplied ones are read only.

To use the shortcut application solution:

1. Click on the appropriate numbered icon.
2. Modify the routine as needed to suit the live sample.
3. Click on to run the routine.

Save the modified routine if required by:

1. Ensure that the routine window is current (highlighted).
2. Click on "File" to reveal the drop down menu.
3. Click on "Save As" to open the standard windows dialog.
4. Type in a new file name and save.
5. Reassign the shortcut path as needed.

Guidelines for the modification of the eight supplied shortcut application solutions

The supplied shortcut application solutions have been constructed around the supplied linked image. While the routines have been developed to work over a range of image conditions, your live sample may be sufficiently different that various steps in the routine may need modification as indicated below.

1. To run any of the shortcut routines on a live sample it will be necessary to delete the "load image" step.
2. If the illumination of your sample is different to the supplied stored one, or if the etched condition is different, then the thresholding step will need adjustment. Simply highlight that step and click on to edit the step.
3. If the magnification or the feature size of the sample is different to that used in the stored image, then any "Trap", "Chord Size", or "Feature Size Transfer" steps may need adjustment. Again use the button to edit all the appropriate steps.
4. A different range of measurement parameters may be needed, use the button to adjust as necessary. If necessary, save changes to a new filename.

Image Database and Automatic Report generator

Overview

The Omnimet Enterprise version 4.0 includes a powerful database and report generator for the storage of images and associated data along with the capability to send these to Microsoft Word for professional report generation.

The database is organized in a logical structure with images stored under a Specimens folder and specimens stored under a Project folder. Under each folder there are a number of fields for the user to enter additional information about the image. The labels for these fields are user definable. Images and projects may be quickly retrieved by using a filter based search tool that works on any of the data fields.

Getting Started

The database and report writer function of the Omnimet Enterprise are all self contained and do not demand that the user separately open any additional software. Microsoft Word 2000 will be opened automatically by the Omnimet when needed for report generation.

When launching the Omnimet Enterprise application, the user will be prompted to enter their name in a log on screen. If the system is new and has not been run before, the entry field will be blank as shown in Figure 13-1, otherwise it will show the name of the last user.

Figure 13-1 Logon screen

Type in your name, and click OK or simply click OK directly if your name is already showing. This name will subsequently show in the database entries when new projects are made.

After logging on, you will see the Omnimet Enterprise Desktop GUI as shown below in Figure 13-2 with the database view occupying most of the screen. If the database is not needed at this time and only access to the image analysis functions are needed, then simply minimize the database view.

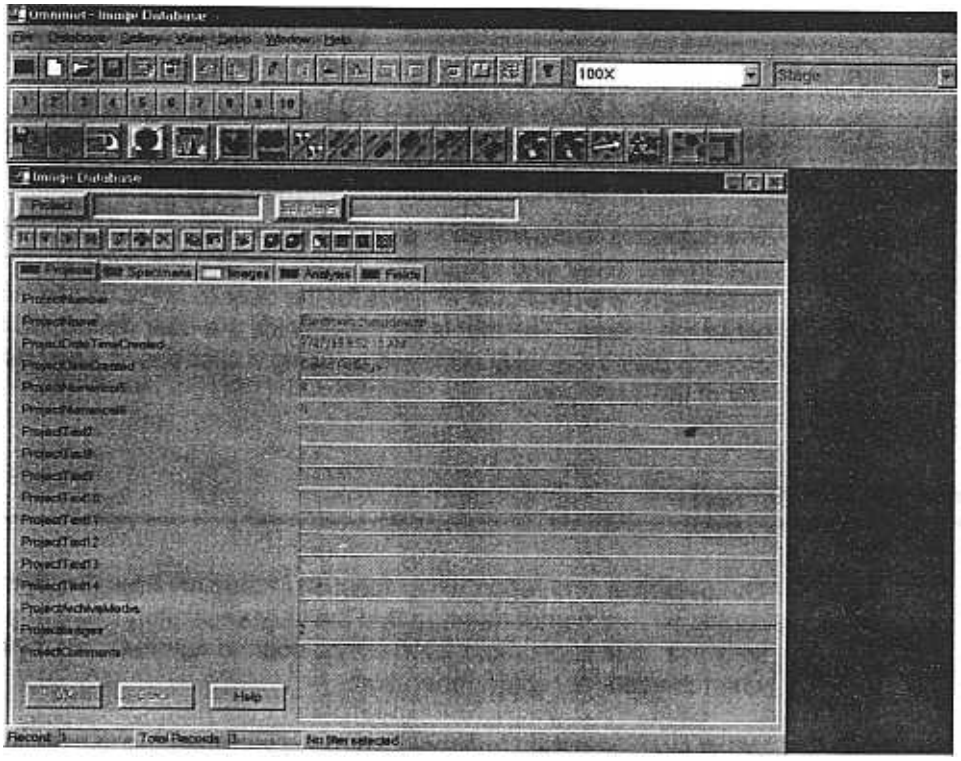


Figure 13-2 Omnimet Enterprise Desktop GUI

Saving Images to Image Database

In order to be able to save images to the database it is necessary to have:

1. An image in the image window to save to the database.
2. Database open at the image folder level with project and specimen folders defined.

This is achieved as follows:

1. Either open an existing project or start a new one (page 13-9).
2. Lock this project using the project button (the button should then appear as being depressed and the project number should appear in the adjacent window.)
3. Click on the Specimen tab and either use the scroll buttons to locate a specimen to place the images under, or create a new specimen (page 13-11). In either case, once the correct specimen information is showing in the dialog, lock it down by depressing the Specimen button . This will cause the specimen name to show in the window adjacent to the specimen lock-down button.
4. Next, click on the Images tab to reveal the images dialog for the database. If this specimen name has no prior images under it, then the page will show Record = 0 and Total Records = 0 at the bottom left edge of the dialog as shown in Figure 13-3. It will also have no thumbnail image showing.

Figure 13-3 Records Status Bar

If the specimen name has prior images then the number of these will be shown in the read out shown in Figure 13-3 and a thumbnail of the currently selected database image will be shown in the bottom right hand corner.

5. If there is no current live image or an imported image showing in the image window then click on File in the main header of the Enterprise and select either: New Image for a live image, or Open Image to import one.
6. Once there is an image in the window there are two methods to copy it to the database.

   a) **Quick Method** - Simply press the button that is on the image window frame. This will copy the image to the database with just the automatically linked data attached. The user will need to use the Edit tool to enter any additional data into the eight remaining fields. The record readout seen in Figure 13-3 should increment by one and a thumbnail of the database image will appear in the bottom right hand corner of the Database Image view.

b) **Standard Method** - With the required image in the image window toggle to the Database view by either, clicking on a portion of the database dialog that extends beyond the current image window, or click on Window as shown in Figure 13-4 then select Image Database.

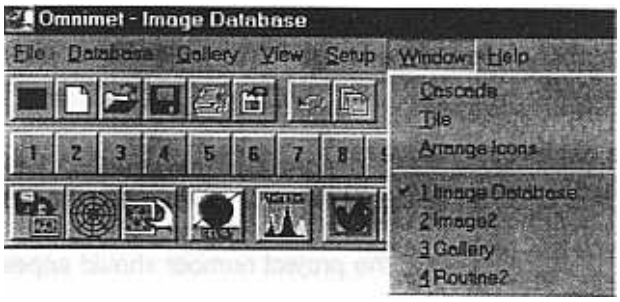


Figure 13-4 Windows Menu

With the Image Database showing, click on the button in the Database toolbar, you may now enter data associated with the image under eight different field headings. You may enter data, or choose to enter nothing. Either way simply click OK to close the "Add data" mode the image will be added to the database as shown by its thumbnail under the Images tab.

Generating Reports using the Database

The Omnimet Report Generator that is built into the Image Database allows the user to send a single image, or a range of images to the report queue for report generation. From the report queue, the user may select an appropriate template from the six standard ones supplied according to whether one, two, three, four or six images are to appear on each page of the report.

Generating a Single Image Report

To send just a single image to the report queue:

1. Simply navigate down through the projects and specimen folders to the correct project\specimen\image level, if known, then scroll through the images at this level until the appropriate thumbnail shows. Alternatively use the database filter tool to automatically locate the desired image (page 13-23.)
2. Click on File, then select "Add to Report Queue" as shown in Figure 13-5.

Figure 13-5 Database File Menu "Add to Report Queue"

3. Clicking on "Add to Report Queue" will generate a dialog showing how many records have been added to the queue as shown in Figure 13-6 below. Press OK to clear this configuration dialog.

Figure 13-6 Add to Report Queue dialog

4 Return to the File drop down as shown in Figure 13-5 and select Report Queue Contents dialog as shown in Figure 13-7.

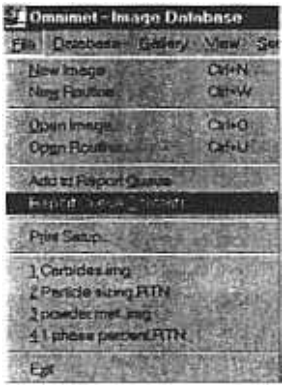


Figure 13-7 Database File Menu "Report Queue Contents"

5 For this single image, its name will already be highlighted, to make the report simply click on the "Create Report" button shown in Figure 13-8. This will cause a File Open dialog window to open.

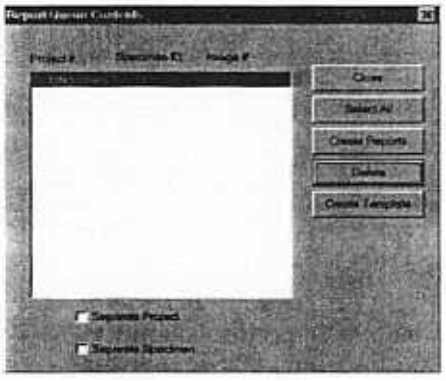


Figure 13-8 Report Queue Contents dialog

6. If it does not open to the template directory under MS Office (C:\Program Files\MS Office\Templates) then navigate through the directories until six templates named 1pix, 2pixL, 2pixP, 3pixL, 3x2pixL, and 4pixL are visible. Highlight the 1pix template for the single image then click Open to generate the report. MS Word 2000 will now automatically open and the chosen image with linked data will be inserted into the template. You may choose to enter

Generating a Multiple Image Report

The Omnimet Enterprise has the capability to make reports from multiple images with one, two, three, four or six images on a page. The 1pix template allows the user to create a report with a single image in portrait view. The 2pixL template allows the user to create a report with two images in landscape view. The 2pixP template allows the user to create a report with two images in portrait view. The 3pixL template allows the user to create a report with three images in landscape view. The 3x2pixL allows the user to create a report with six images in landscape view. Finally, there is the 4pixL template which allows the user to create a report with four images on a landscape view. An outline view of the standard supplied templates can be seen on page 13-7. Whichever format of report template is chosen, the queued images will be pasted in, along with associated data according to the bookmarks in these templates. In the case where the number of queued images exceeds the number of image placement boxes on a page, then additional pages are generated until the images are accommodated.

To create a report the user must first add contents to the Report Queue (page 13-4). There are different ways to get a range of images. An outline of these available formats is shown on page 13-7.

To create the report:

1. Add the required images to the report queue using the "Add to Report Queue" command under File (see Figure 13-5). The images may be selected individually at the image tab level of the database or a range of images may be added to the report queue at the specimen and project tab levels.
2. Use the "Report Queue Contents" command under File (see Figure 13-7) to view the images names being queued ready for report generation. All the image filenames are highlighted by default. Simply click on those that are not required to go to the report. This will deselect them.
3. Next, click on "Create Reports" to access the open template dialog seen in Figure 13-9 below.

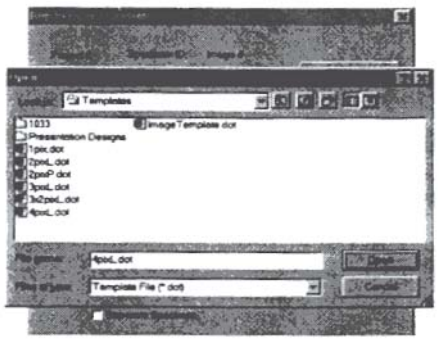


Figure 13-9 Open template dialog

Choose the required template and observe the images and linked text being automatically inserted into the Report.

For multiple image reports with images from multiple projects\specimens:

Separate Project: Checking the option will initiate a page break in the report each time the project number changes.

There are five tabs in the Image Database. These are the: Projects Tab, Specimens Tab, Images Tab, Analysis Tab, and the Fields Tab. Below are descriptions of each tab and its function.

Tabs:

Projects Tab:

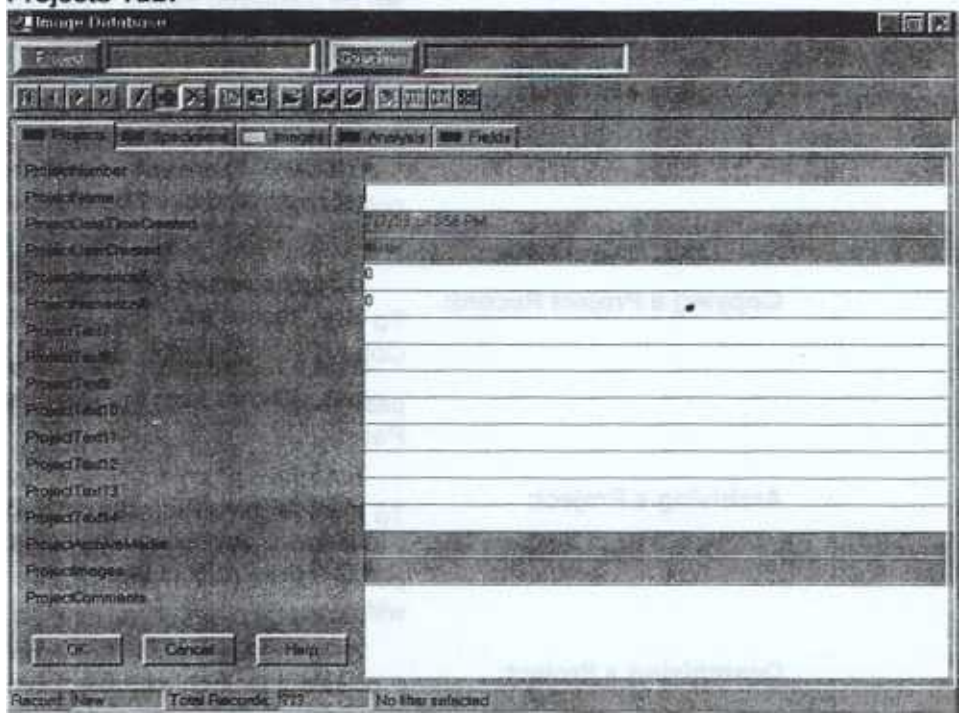


Figure 13-17 Projects Tab

Adding a New Project:

A project may be added by pressing the [redacted] button as seen in Figure 13-17. The user may enter values into the open fields. Press OK when finished. The ProjectNumber is automatically set when OK is pressed. To save the new project press OK, or press the Add button again. To cancel all changes press Cancel, or press the Esc key.

Scrolling through Projects:

The [redacted] button will allow the user to scroll through each project on the database.

Locking a Project:

To lock a project, press the Project button. The current project number will now show in the window next to the lock down button.

Editing a Project:

To edit a record in the Projects tab press the button, or select Edit Record from the Database pulldown. The user may now enter values into the fields that need to be edited. To save the changes press OK, or press the edit button again. If you press the edit button, a message will be displayed asking if you want to save changes, click yes. To cancel all changes press Cancel, or press the Esc key.

Deleting a Project:

To delete a project press the button, or select Delete Record from the Database pulldown. There will be a confirmation dialog that must be clicked before deletion occurs.

Copying a Project Record:

To copy a record press the button, or select Copy Record from the Database pulldown. To paste a record press the button, or select Paste Record from the Database drop down.

Archiving a Project:

To Archive a project click on the button, or select Archive Project from the Database pulldown. Archiving may only be undertaken within the Projects tab.

Dearchiving a Project:

To Dearchive a project click on the button, or select Dearchive Project from the Database pulldown. Dearchiving can only be done in the Projects tab.

Project Record Search using Filters:

The button will open the Filter dialog for the Projects tab.

Report Queue Contents:

The button will open the Report Queue Contents dialog.

Adding Images to the Report Queue Contents:

The button will add the current project images to the Report Queue.

Image Gallery:

The button will open the Image Gallery in which thumbnails of images in the database will be displayed.

Specimens Tab:

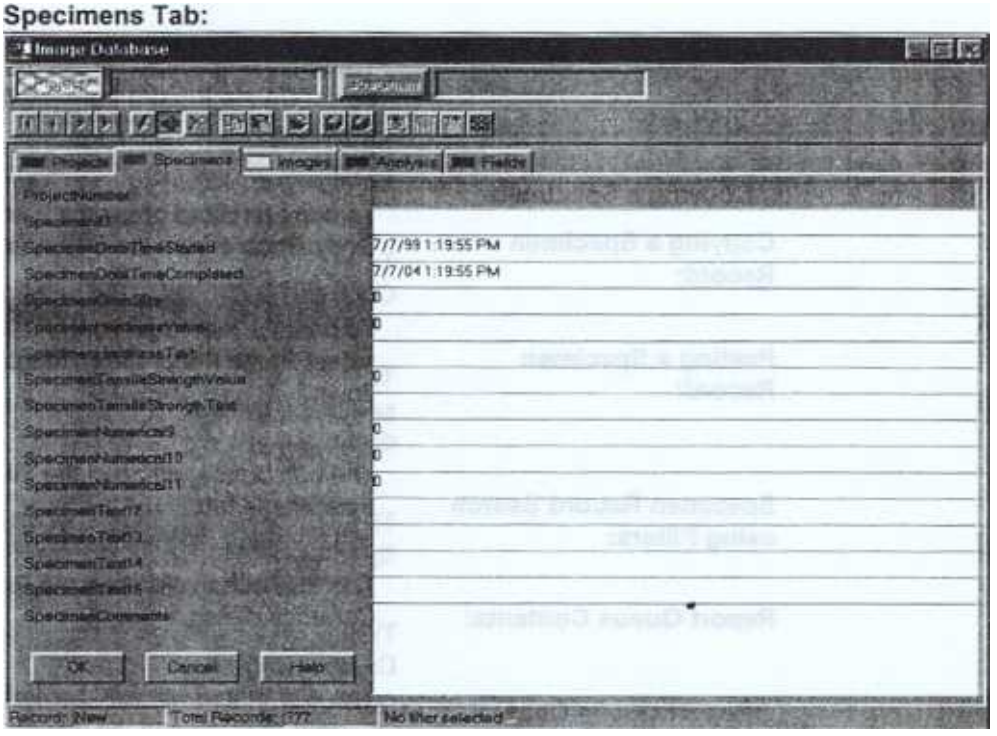


Figure 13-18 Specimens Tab

Adding a New Specimen:

A specimen may be added by pressing the [redacted] button as seen in Figure 13-18. In order to add a specimen a project must be locked. The user may enter values into the open fields. To save the new specimen press OK, or press the Add button again. To cancel all changes press Cancel, or press the Esc key.

Scrolling through Specimen Records:

The [redacted] button will allow the user to scroll through each specimen the current specimen id will now show in the window next to the lock down button.

Locking a Specimen:

To lock a specimen, press the [redacted] button on the database.

Editing a Specimen Record:

To edit a record in the Specimens tab press the [redacted] button, or select Edit Record from the Database pulldown. The user may now enter values into the fields that need to be edited. To save the changes press OK, or press the edit button again. If you press the edit button, a message will be displayed asking if you want to save changes, click yes. To cancel all changes press Cancel, or press the Esc key.

Deleting a Specimen:

To delete a specimen press the button, or select Delete Record from the Database pulldown.

Copying a Specimen Record:

To copy a record press the button, or select Copy Record from the Database pulldown.

Pasting a Specimen Record:

To paste a record press the button, or select Paste Record from the Database drop down.

Specimen Record Search using Filters:

The button will open the Filter dialog for the Specimens tab.

Report Queue Contents:

The button will open the Report Queue Contents dialog.

Adding Images to the Report Queue Contents:

The button will add the contents of the current specimen to the Report Queue.

Image Gallery:

The button will open the Image Gallery in which thumbnails of images in the database will be displayed.

Images Tab:

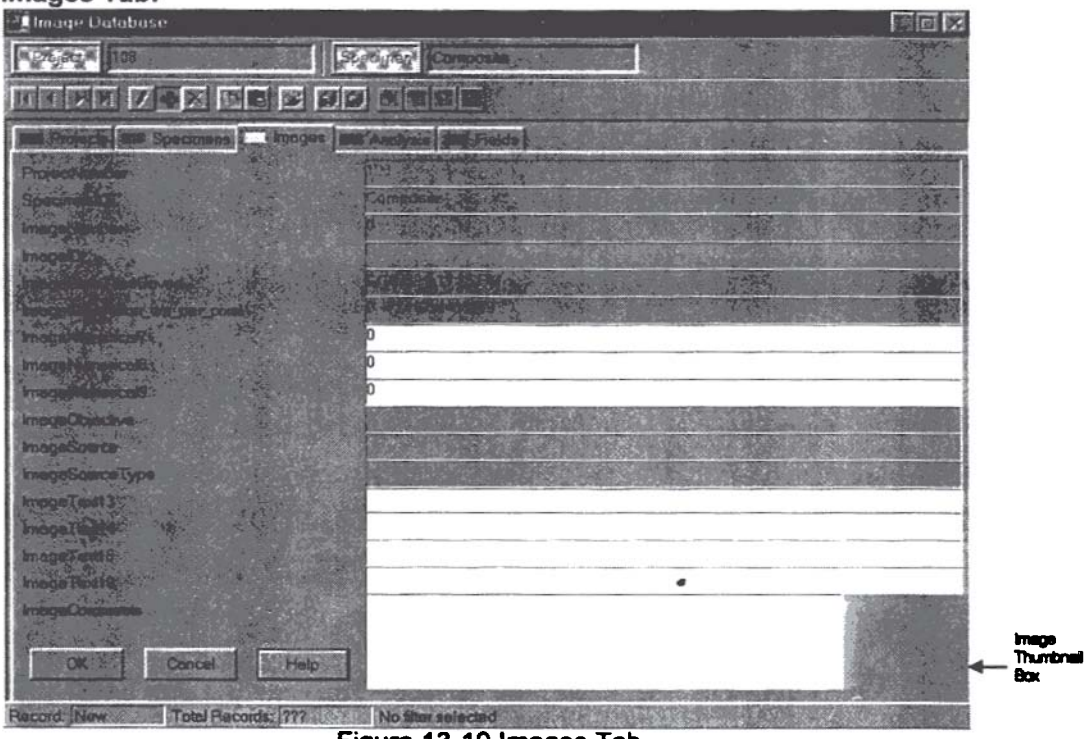


Figure 13-19 Images Tab

Adding Images and Data:

An image can be added by pressing the [redacted] button as seen in Figure 13-19. In order to add a image both the project and specimen must be locked. The user may enter values into the open fields. An image thumbnail will be placed in the bottom right hand corner of the image database as indicated in Figure 13-20. To save the new image press OK, or press the Add button again. To cancel all changes press Cancel, or press the Esc key.

Scrolling through Images:

The [redacted] button will allow the user to scroll through each image.

Editing an Image Record:

To edit a record in the Images tab press the [redacted] button, or select Edit Record from the Database pulldown. The user may now enter values into the fields that need to be edited. To save the changes press OK, or press the edit button again. If you press the edit button, a message will be displayed asking if you want to save changes, click yes. To cancel all changes press Cancel, or press the Esc key.

Deleting Images:

To delete an image press the [redacted] button, or select Delete Record from the Database

Copying an Image Record:

To copy a record press the button, or select Copy Record from the Database pulldown.

Pasting an Image Record:

To paste a record press the button, or select Paste Record from the Database drop down.

Opening\Retrieving a Record:

To open\retrieve a record press the button, or select Retrieve Record from the Database pulldown.

Image Record Search using Filters:

The button will open the Filter dialog for the Images tab.

Report Queue Contents:

The button will open the Report Queue Contents dialog.

Adding Images to the Report Queue:

The button will add the current image to the Report Queue.

Image Gallery:

The button will open the Image Gallery and show the current Project\Specimen images.

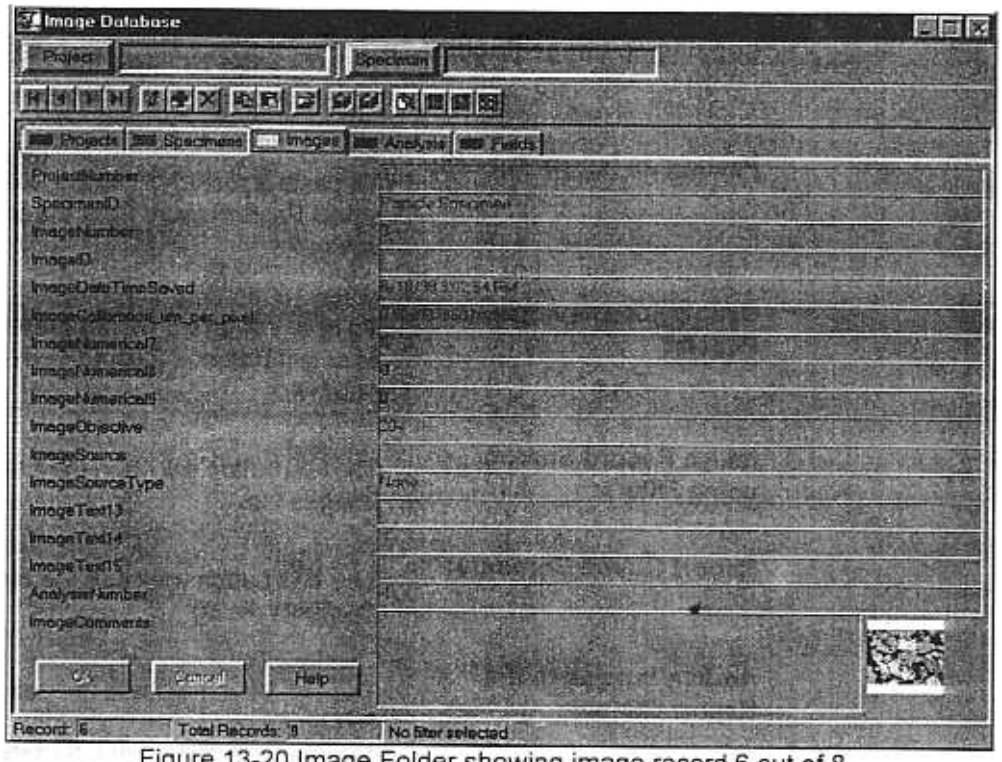


Figure 13-20 Image Folder showing image record 6 out of 8

Analysis Tab:

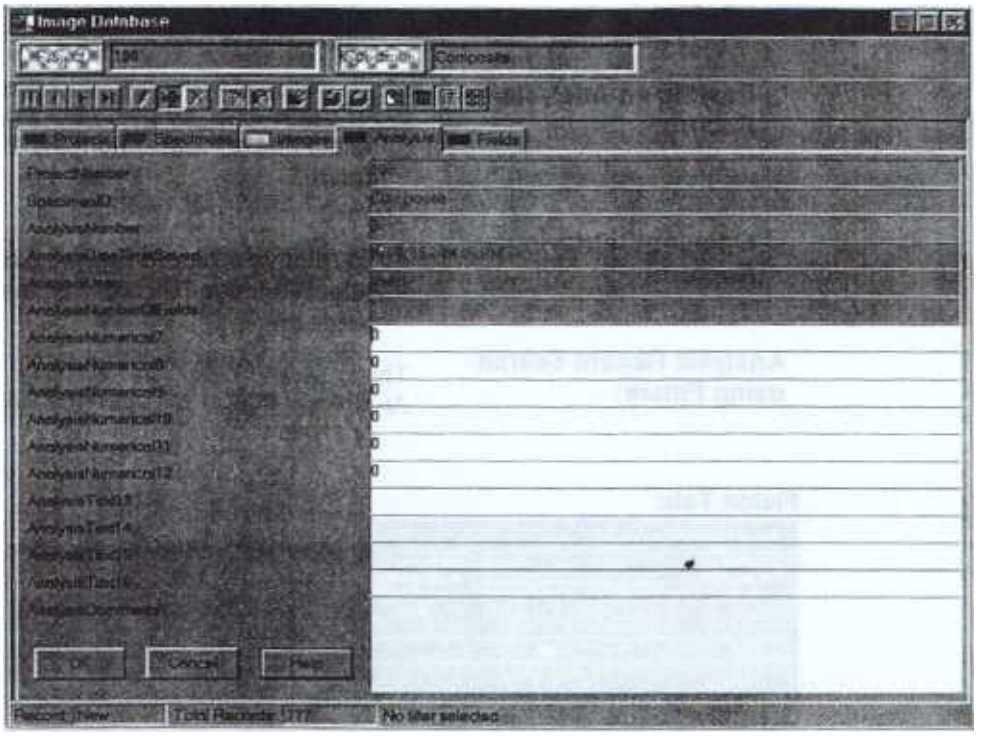


Figure 13-21 Analysis Tab

Adding Image Analysis Information:

Analysis information may be added by pressing the [redacted] button as shown above. In order to add an analysis, the user must run a routine and both the project and specimen must be locked. The user may enter values into the open fields. To save the new analysis press OK, or press the Add button again. To cancel all changes press Cancel, or press the Esc key.

Scrolling through Analysis Information:

The [redacted] button will allow the user to scroll through each available analysis.

Editing an Analysis Information:

To edit a record in the Analysis tab press the [redacted] button, or select Edit Record from the Database pulldown. The user may now enter values into the fields that need to be edited. To save the changes press OK, or press the edit button again. If you press the edit button a message will be displayed asking if you want to save changes click yes. To cancel all changes press Cancel, or press the Esc key.

Deleting an Analysis Record:

To delete a analysis press the [redacted] button, or select Delete Record from the Database pulldown.

Overview

The Image Gallery allows the user to view groups of thumbnails of images in the database of the Omnimet.

The number of thumbnails that are viewable in the gallery is dependant on several factors:

1. The configuration of the Gallery view (number of rows and columns to be displayed).
2. The degree of filtering currently present in the database. In this way, the gallery will show only those thumbnail records according to whether: a project is selected and locked, a specimen is selected and locked, and whether the user is at the image folder tab level or not.
3. Whether the filter search tool has been used to select an image or range of images.

If no project is selected and locked, then all the image records currently in the database will be represented by thumbnails in the Gallery. When there are more image record thumbnails than can be displayed on one page of the gallery view, then the user will need to navigate through the pages using the [redacted] tools.

Accessing the Gallery View

To bring the Image Gallery into view, the database view must be the active window if the Omnimet has an image window present. This can be confirmed by observing the main title bar of the Omnimet user interface, it should appear as below in Figure 13-23.

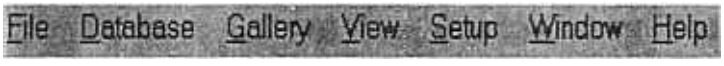
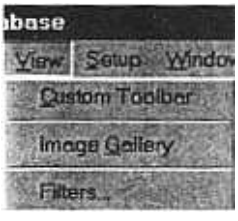


Figure 13-23 Main title bar of Omnimet when database is active

The Steps to open the Gallery View are:

1. Click on "View" as seen above in Figure 13-23 to reveal the drop down menu shown in Figure 13-24 below.
2. Click on Image Gallery to open the Image Gallery view. The number of image thumbnails being displayed will depend on the current level of filters in the database.



Copying an Analysis Record:

To copy a record press the button, or select Copy Record from the Database pulldown.

Pasting an Analysis Record:

To paste a record press the button, or select Paste Record from the Database drop down.

Opening\Retrieving a Record:

To retrieve a record press the button, or select Retrieve Record from the Database pulldown.

Analysis Record Search using Filters:

The button will open the Filter dialog for the Analysis tab.

Fields Tab:

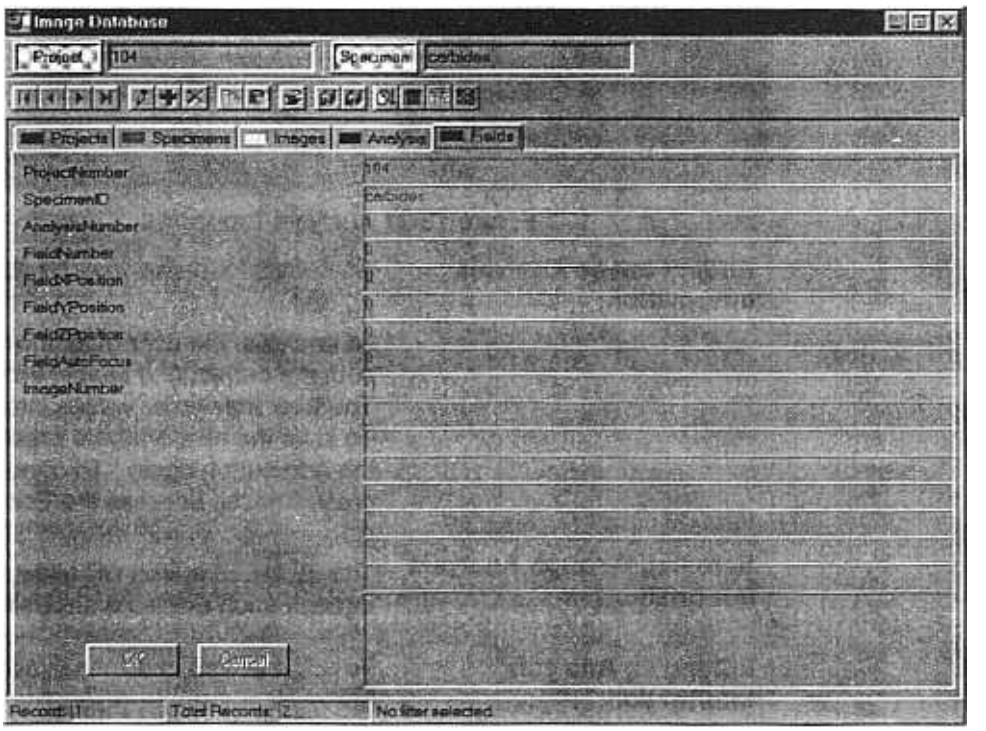


Figure 13-22 Fields Tab

The purpose of the Fields tab is to hold the results from the routines saved in the Analysis tab. Once an Analysis is added the results are automatically saved in the Fields tab. The values from the routine are automatically entered into the Fields tab when a new analysis is saved. The values cannot be edited.

The button is active and will open the Filter dialog for the Projects tab.

The button is active and will open the Report Queue Contents dialog.

The button is active and will open the Image Gallery to show thumbnails of images under the current project\specimen selection.

Or

Click the icon in the Database view toolbar. The Image Gallery will now be displayed as shown in Figure 13-25 below.

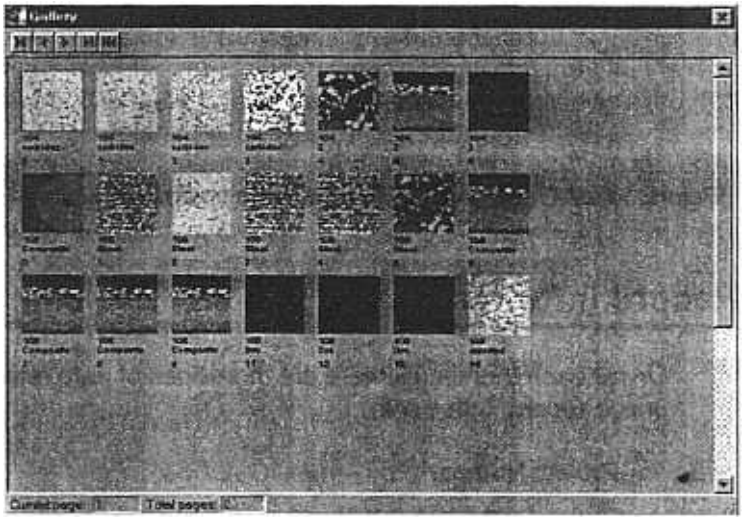


Figure 13-25 Gallery View

Image Gallery in Detail

Navigation of multiple pages.

Clicking this icon displays the first page of the Image Gallery record.

Clicking this icon moves the view one page back toward the beginning of the Image Gallery record.

Clicking this icon moves the view one page forward toward the end of the Image Gallery record.

Clicking this icon displays the last page of the Image Gallery record.

Clicking this icon opens a further dialog as seen below in Figure 13-26 to allow the user to click on the page number to go to. Once the appropriate page number is selected in this dialog, clicking OK will display the page view.

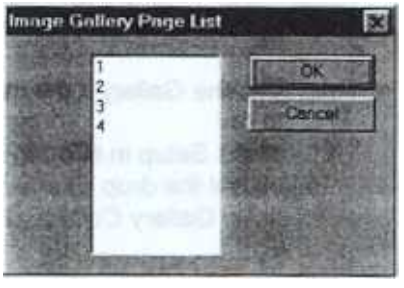


Figure 13-26 Image Gallery Page List

When navigating multiple pages, the current page location and the total number of pages available to view are displayed in read out dialogs at the bottom left portion of the Gallery view status bar as seen in Figure 13-27 below.

Figure 13-27 Gallery View Multiple Page position indicator

Image Record Information

Under each thumbnail, there are three lines of data relating to the original image record, those are:

1. Project Number
2. Specimen Name
3. Image Number

Opening a Record from the Image Gallery View

When in the Image Gallery view, the user may click on a thumbnail to select it as indicated by an outer red border. Double clicking the selected thumbnail will cause that image to be retrieved from the database and displayed in the Image Window. If there was an existing image in the Image Window, the user may be prompted to save changes if it has been altered since it was last saved.

Gallery Configuration

The user may choose the number of thumbnails that are to be displayed per page by using the Gallery Config tool. It should be noted however that choosing fewer thumbnails to display does not change the size of the thumbnails. They are of fixed size regardless of how many are being displayed.

To access the Gallery Configuration Utility:

1 Click on Setup in the main Omnimet header when in Database view to reveal the drop down menu as shown below in Figure 13-28 and click on Gallery Config.

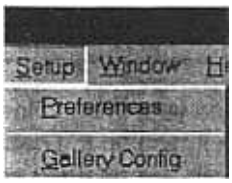


Figure 13-28 Gallery Configuration

2. The dialog shown below in Figure 13-29 will be generated to allow the user to change the number of thumbnail rows and thumbnail columns.

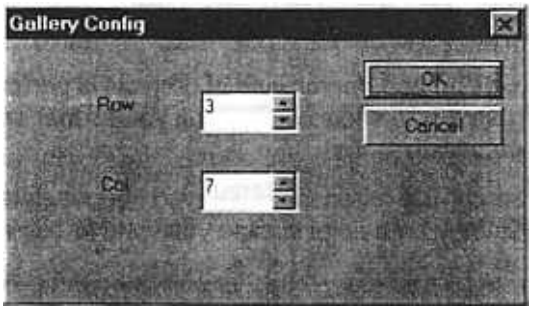


Figure 13-29 Gallery Config Setup dialog

3. Change the number of rows and columns to be displayed using the increment, decrement spin tools, or click and highlight the current number and over-type with the new value. Click OK to set the new values and exit the dialog. Click Cancel if no change is to be made.

Please note that the maximum number of rows and columns that can be displayed is 10. If the number of thumbnails being displayed exceeds the Gallery view window size, then scroll and pan tools are automatically generated to allow the user to view thumbnails beyond the frame edge. Alternatively, the user may click and drag the Gallery view frame edges to enlarge the view until all the thumbnails can be viewed.

Archiving Databased Images

Archiving moves your image files to an external Storage Medium in order to recover disk space on the hard disk for the Image Database. All project image thumbnails are retained and shown in the image gallery for reference, even when the actual image files are archived to an external storage medium. When opening an image via the thumbnail, the Omnimet will direct the operator to the specific archive medium I.D. assigned during the archive process.

Archiving Database Config under User Preferences

Archiving and dearchiving of projects is performed in a structured format. Figure 13-30 shows the default values that are used for archiving and dearchiving paths.

Dearchiving retransmits archived images data back to your hard disk. This may be helpful in case you want to edit an archived Project.

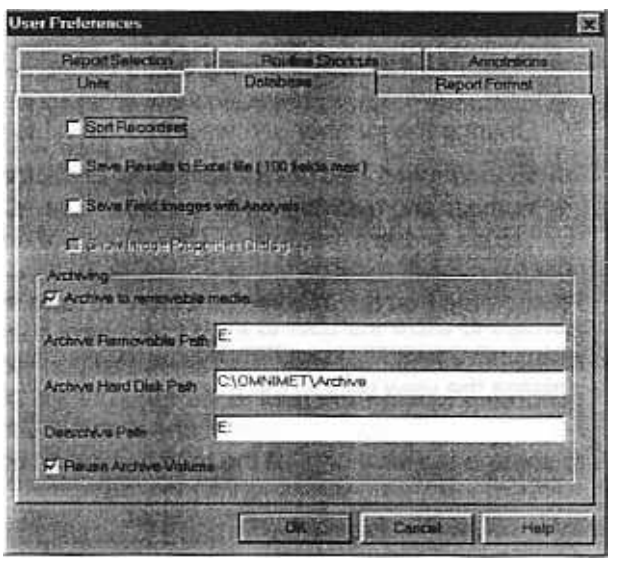


Figure 13-30 User Preferences Database Tab

Archive to removable media:	Select this option if you want to archive images to the removable media.
Archive Removable Path:	The user may specify the path for the removable media drive in this box.
Archive Hard Disk Path:	The user may specify the archive hard disk path. This is the directory where the database saves all the information.
Dearchive Path:	The user specify the dearchive path in this box.
Reuse Archive Volume:	Select this option if you wish to delete the archive volume after you de-archive the media.

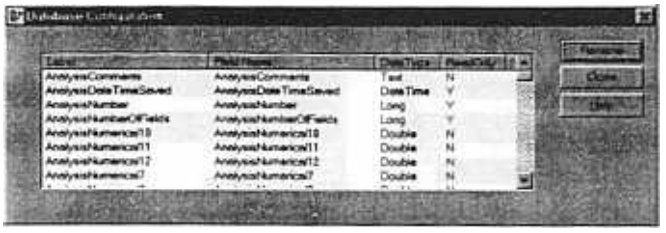


Figure 13-31 Database Configuration

The purpose of the Database Configuration is to enable the user to make changes to the database fieldnames. There are three columns in the dialog. The Label column contains the labels of the user interface of the database. The Field Name column contains the actual field names in the database. The Data Type column indicates the data type of each field in the database and shows whether the data to be entered should be text only, numeric only, or alphanumeric. The ReadOnly column shows whether the field is read only or not. You can only rename the information in the label column. The Database Configuration checks for duplicated labels. Only unique labels can be saved in the database. The Database Configuration program also does not allow the user to type in special characters or use a space between words.

The [redacted] button pops up the Label Dialog box shown below.

To rename a label of the database, you can do the following

1. Select a label by left mouse clicking the label.
2. Click the Rename button.
3. Type in the new label in the Label Dialog.
4. Click OK.

Clicking OK in the Label Dialog box will replace the original label name. Clicking Cancel in the Label Dialog box will not replace the original label name. Clicking the [redacted] button will exit out of the Database Configuration. Clicking the [redacted] button will open the dbconfig help file

Each tab has its own filter. The following are the different filters for each tab:

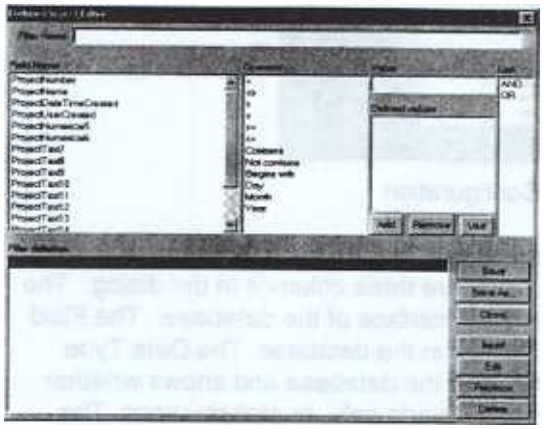


Figure 13-32 Projects Filter Dialog

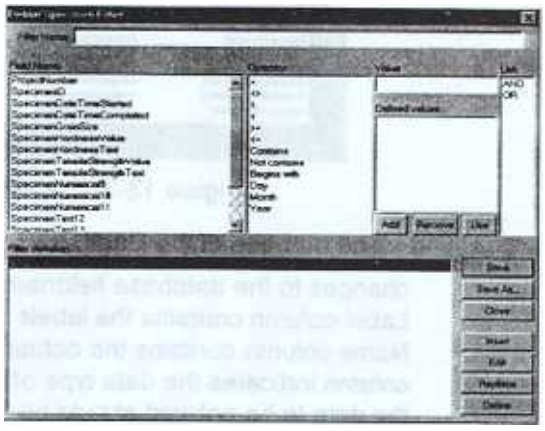


Figure 13-33 Specimens Filter Dialog

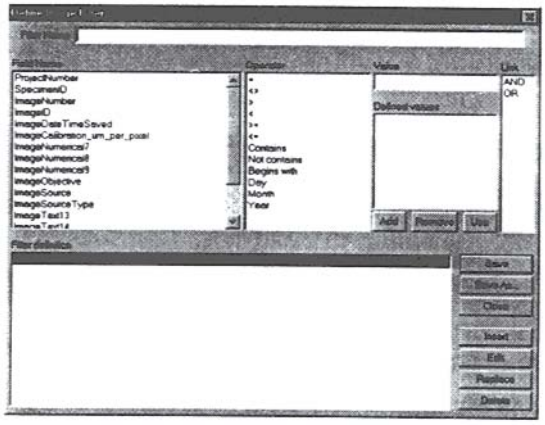


Figure 13-34 Images Filter Dialog

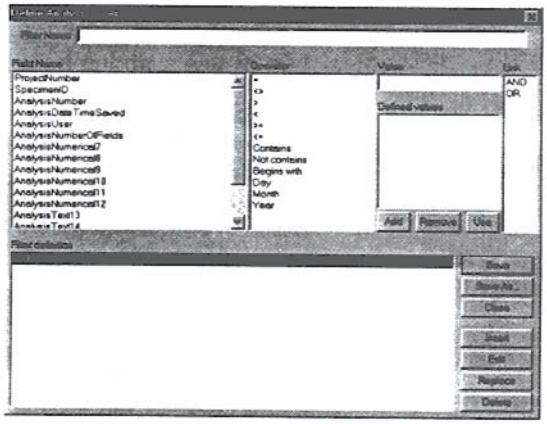


Figure 13-35 Analysis Filter Dialog

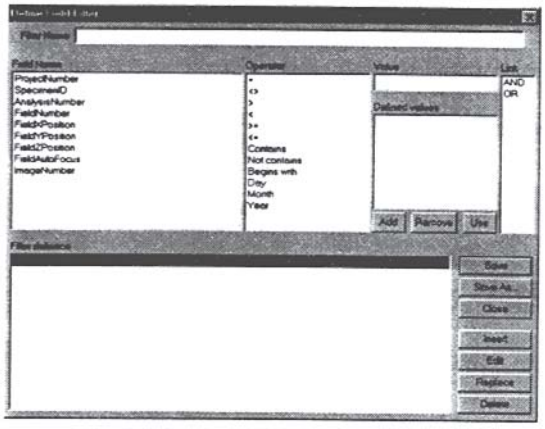


Figure 13-36 Fields Filter Dialog

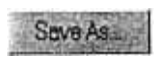
Filter functionality

Add will insert the Value into the Defined values box seen in Figures 13-32 to 13-36.

Remove will delete the selected Value in the Defined values box seen in Figures 13-32 to 13-36.

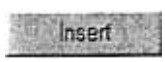
Use will place the selected value into the Value position box seen in Figures 13-32 to 13-36.

Save will save the current Filter Definition. In order to save a filter the Filter Name, Field Name, Operator, and Value must be selected.



Save As will save any changes made to the current Filter Definition with the option of changing the Filter Name.

To exit out of the Filters dialog press the close button Close will not save any changes made to the current Filter Definition.



Insert will insert the Field Name, Operator, and Value into the current Filter Definition.

Edit will allow the user to make changes to the current Filter Definition.

Replace will replace the current Filter Definition with the changed options.

Delete will delete the current Filter Definition

Note: Upon exiting and reentering Enterprise that the filter is removed

In order to create an automatic report, the Omnimet Enterprise must be open. MS Word will automatically open as soon as the 'Export to Word' selection is made if it is not already running in the background. Once a routine has been run that generates results, the user need only ensure that the actual page of results required in the report is the one that is currently displayed (only the top page from the potentially multi-page results viewer is copied into the report). The remainder of the report generation is automatic once the 'Export to Word' selection is made. Figure 14-1 below shows the selection of Export to Word from the File pull-down menu.

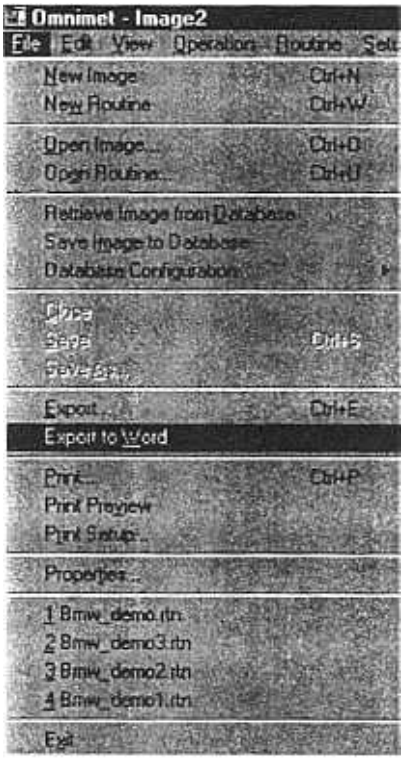


Figure 14-1 Part of the File pull down showing the Export to Word selection

As soon as the Export to Word selection is made, MS Word in MS Office will automatically start if it is not already running and the default report template will open. At this point the original gray image will be pasted into the space for the gray image in the report, the modified image will be pasted into the space labeled 'Detected image' and the top page of the results will be pasted into the space set aside for results. The images and results are automatically sized into the template frames and any associated data automatically entered into the table headings of the report. An example of the standard report from the default template is given on the next page as Figure 14-2.

Once the report has been made, the user has the choice to print it and close the Word document without saving, or printing it and saving the document with a logical name in a preferred location.

Quality Report

Company name

Central Laboratories

Date: January 15, 2000

Requester:
Vendor:
Material:

Report :
Objective:
Calibration: 0.47244 µm/Pixel

Heat No:

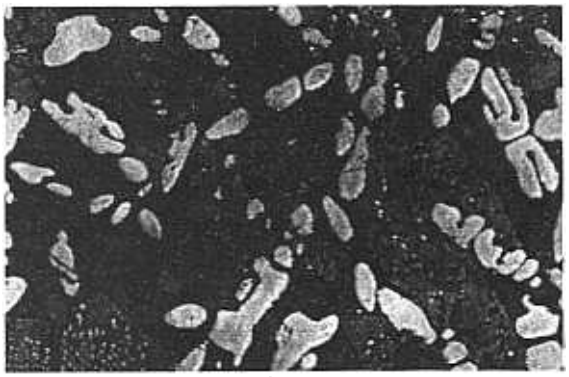


Fig. 1 Captured image

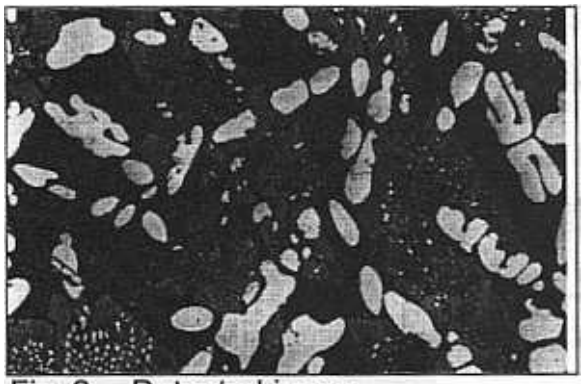


Fig. 2 Detected image

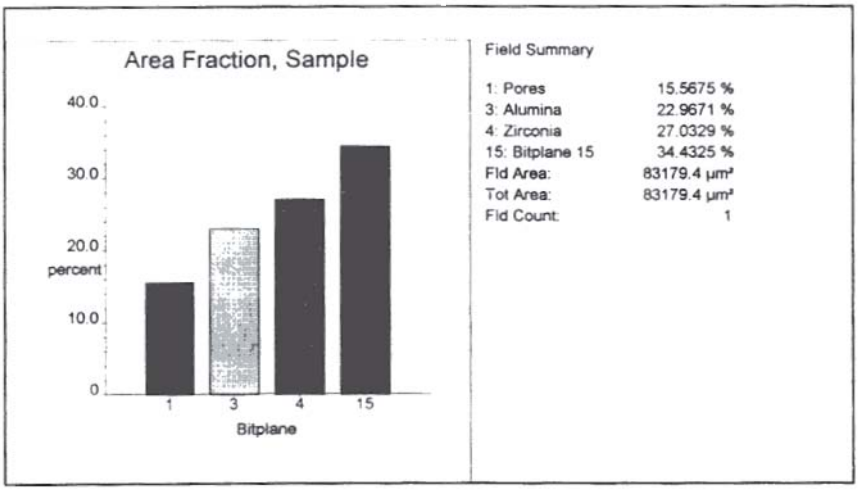


Fig. 3 Image Analysis Measurements

Comments

Signature:_____

Figure 14-2 Sample report

Modifying the Template

The template that is shipped with the Omnimet Enterprise can be modified to better suit individual needs as described here. The template is located under the directory C:\Program Files\Buehler\Enterprise\ReportTemplate. It is important that this path is kept as the Enterprise is programmed to look at this location in order to automatically make the report in Word with the 'Export to Word' command. Figure 14-3 below shows the path leading to the Enterprise template.

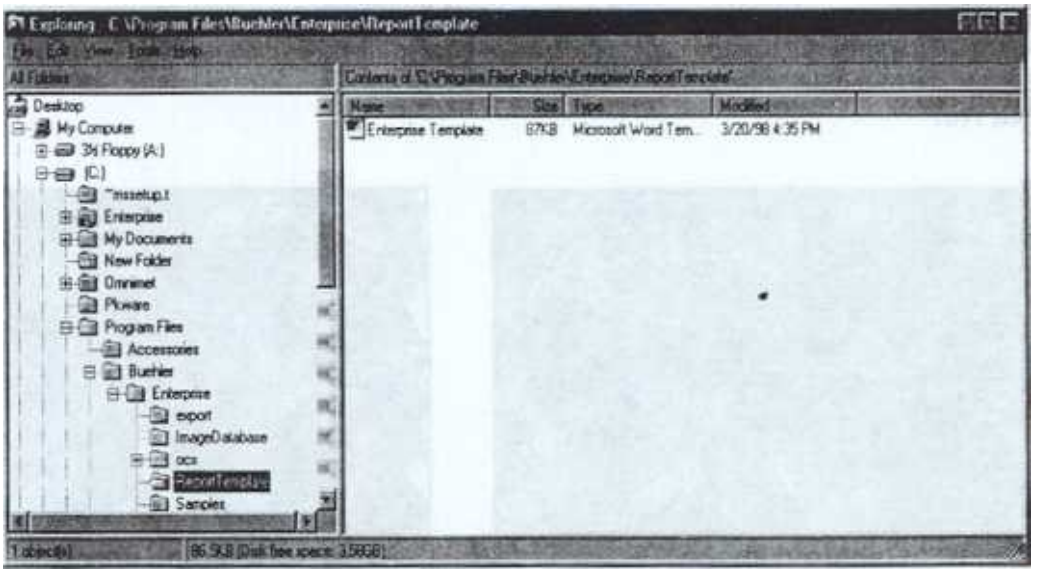


Figure 14-3 Location of the Enterprise Report Template

Other templates may be created and modified to suit the needs of each person, but it must be remembered that only the one called 'Enterprise Template', residing within the Enterprise template directory, will allow automatic report generation. Thus, if this automated feature is to be retained after modification of the default Enterprise template, then neither its name, nor its location can be changed after modification.

The choices therefore are:

1. Use the Buehler supplied Enterprise template as is, with no modification whatever.

2. Modify the Enterprise template but keep the exact same name and directory location in order to retain its ability to be opened automatically.

3. Using the Enterprise template - make additional templates with other names, underneath another location that are opened manually from within Microsoft Word.

For cases 2 and 3 above, the following applies - first, the Enterprise template should be Opened. It can be found under C:\Program Files\Buehler\Enterprise\Report Template and can be located with Windows explorer as shown above in Figure 14-3.

Alternatively Microsoft Word may be opened and the 'File Open' facility used to locate and open the Enterprise template as seen below in Figure 14-4.

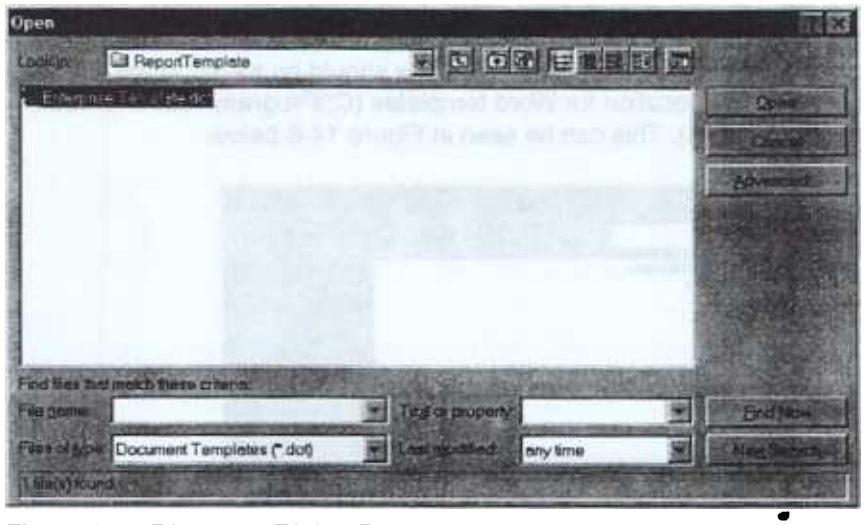


Figure 14-4 File open Dialog Box in Word

Word will generate a dialog box as shown below in Figure 14-5.

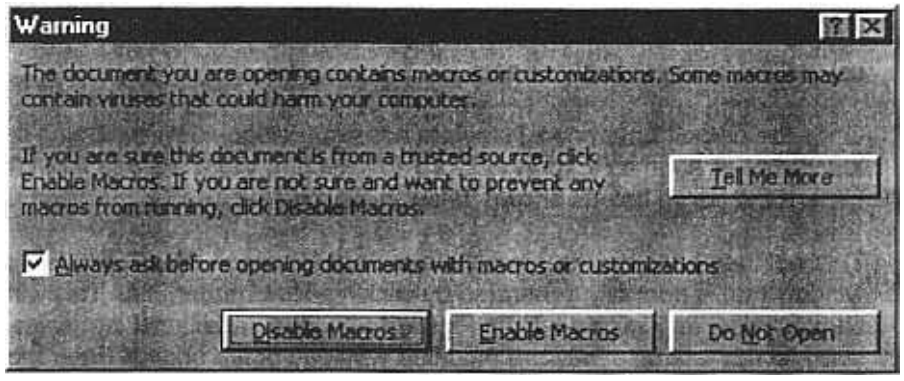

Warning
The document you are opening contains macros or customizations. Some macros may contain viruses that could harm your computer.
If you are sure this document is from a trusted source, click Enable Macros. If you are not sure and want to prevent any macros from running, click Disable Macros.
Tell Me More
Always ask before opening documents with macros or customizations
Disable Macros
Enable Macros
Do Not Open

Figure 14-5 Prompt box after selecting 'Export to Word' without the Template called 'Enterprise Template'

The button named 'Enable Macros' should be clicked in order to proceed.
In either case, once it has been opened, textual changes may be made to the Enterprise Template as with any word processed document. Please note however, that text that is inside the marks << and >> MUST NOT be touched as these are bookmarks and are linked into the Enterprise program.

Once the needed changes have been made, then in the case of item 2 listed prior, it is critical that the modified template is saved as Enterprise Template.dot within the Enterprise Template directory. This is ensured by using 'Save' under File rather than 'Save As.'

In the case of item 3 listed prior, where additional templates are required the 'Save As' function should be used with a filename other than 'Enterprise Template'. This new - additional template should be saved to the standard Microsoft Office location for Word templates (C:\Program Files\Microsoft Office\Templates). This can be seen in Figure 14-6 below.

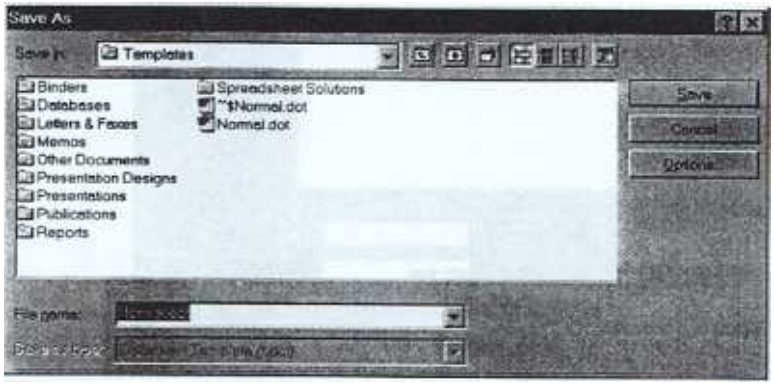
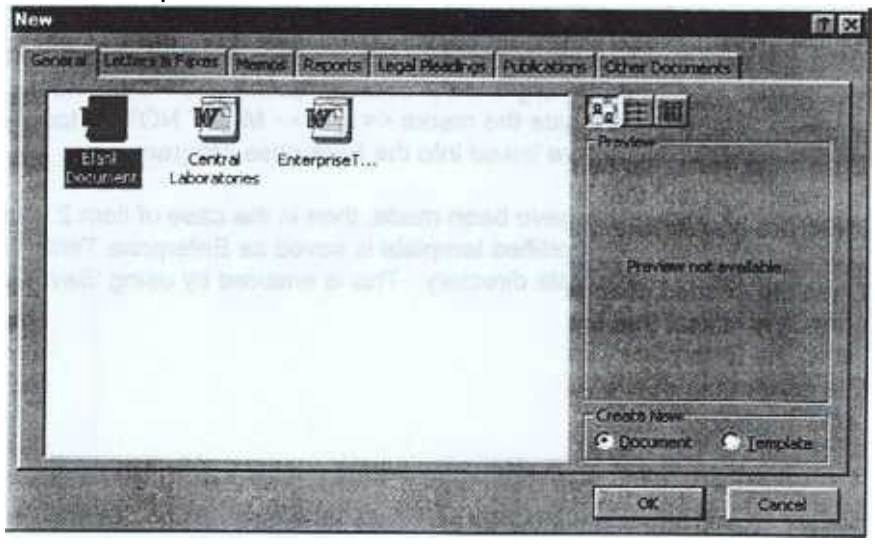


Figure 14-6 File Save As Dialog Box for Templates in Word

In order to be able to have the choice to use these additional templates, the default Enterprise Template will have to be disabled, else it will always open in preference. The default Enterprise Template under the directory C:\Program Files\Buehler\Enterprise\ReportTemplate may easily be disabled by renaming it using Explorer to any other name.

Once the default Enterprise Template has been disabled by renaming it, it will be found that as soon as 'Export to Word' is selected, Word will open, but that it will generate a dialog box as shown below in Figure 14-7.

This will then bring the user into the standard Microsoft Word Template selection window that is normally generated by clicking 'New' under File. This window is shown below as Figure 14-7. In Figure 14-7, the additional templates can be seen, in this example they are modified versions of the original Enterprise Template.



APPENDIX - Binary operations & Measurements

Boolean

Boolean operations perform logical functions between bitplanes.

OR: combines two source bitplanes to form a single destination bitplane.

AND: takes common parts of 2 source bitplanes and integrates into a destination bitplane.

XOR: excludes common parts of 2 sources bitplanes and combines remainder of 2 source bitplanes into destination bitplane.

NOR: excludes both bitplanes from entire image and puts rest of image into destination bitplane.

NAND: excludes common parts of 2 source bitplanes from common image and places remainder of image into destination bitplane.

NXOR: combines common parts of 2 source bitplanes with remainder of image and puts combined bitplanes into destination bitplane.

MINUS: takes the part of Source #1 that is not in Source #2, and puts it into destination bitplane. This function is useful for removing overlap from 2 bitplanes.

Boundary Fill

This function smoothes the object boundary in the selected bitplane by expanding and shrinking the objects. The resulting objects have shapes similar to the original objects. This function is defined as dilation with a square kernel followed by erosion with a cross kernel. It is normally used to substantiate the boundaries before inverting.

Border Eliminate

This function eliminates all objects on the chosen bitplane that touch edge of image processing frame.

Chord Size

This function eliminates objects that cannot completely cover a specified test box of X by Y size. It is useful to eliminate elongated thin objects such as scratches. Do not use this function on grain boundaries as thin boundaries will disappear. An object that does not cover the whole test box can be transferred to another bitplane or discarded (to none). See Trap also.

Clear

This function erases selected bitplane pixels in the entire image

Clear Outside Frame

This function erases selected bitplane pixels outside the Process Frame.

Close

This is dilation followed by erosion. Both operations will be done with same kernel and same number of cycles. You can select number of cycles. Kernel choices include square, hexagon, octagon, horizontal, vertical, and cross. This function is used to fill holes or connect particles in a phase without significantly losing the original shape.

Convex Hull

This function rounds off edges and fills in crevices at edge of particles. It can dilate any concave object until it becomes convex (turning a C into a circle).

Copy

This function copies the selected source bitplane into another bitplane Does not alter information in source bitplane. The source bitplane is turned off and destination bitplane is turned on at end of operation.

Delta Convex Hull

This function sends the changes of the selected bitplane (added pixels) from convex hull to selected bitplane. This is the difference from original image (before convex hull) and the image after applying convex hull.

Delta Dilate

This function sends the changes of the selected bitplane (added pixels) from dilate to selected bitplane. This is difference from original image (before dilate) and image after applying Dilate.

Delta Erode

This function sends the changes of the selected bitplane (subtracted pixels) from erode to selected bitplane. This is difference from original image (before erode) and image after applying Erode.

Delta Prune

This function sends changes of the selected bitplane (subtracted pixels) from prune to selected bitplane. This is difference from original image (before prune) and image after applying Prune.

Delta Thicken

This function sends changes of the selected bitplane (added pixels) from thicken to selected bitplane. This is difference from original image (before thicken) and image after applying Thicken.

Delta Thin

This function sends changes of the selected bitplane (subtracted pixels) from thin to selected bitplane. This is difference from original image (before thin) and image after applying Thin.

Dilate

This function grows objects with the chosen kernel (square, cross, octagon, hexagon, horizontal, or vertical) by adding a layer to the objects.

Erode

This function shrinks objects with the chosen kernel (square, cross, octagon, hexagon, horizontal, or vertical) by peeling a layer off the objects.

Fill

This function fills holes (undetected areas) that are totally enclosed by the detected bitplane

Feature Size Transfer

Feature Size Transfer performs feature separation (sorting) based on a chosen characteristic (shape, length etc.). You can send particles that meet characteristic criteria to any bitplane. You also have the ability to undertake single specification (>5 microns) or multiple (>5 and <2). For multiple you can select from AND and OR. For specification you can choose >, <, =, $\leq$, $\geq$. The calculate limits button computes highest and lowest value for the chosen characteristic in the selected bitplane.

Intersect Transfer

This function transfers any object in source bitplane which overlaps or crosses any object on the intersector bitplane to a destination bitplane. The entire object is transferred not just the portion which overlaps/crosses. The transferred objects are eliminated from the source bitplane. The intersector bitplane is not affected. All three bitplanes are still on at the end of the operation.

Invert

This function inverts the source bitplane. Every pixel that was on is turned off and vice versa.

Open

This function is erosion followed by dilation with the same kernel and the same number of cycles for each operation. Open generally smoothes the contour of an object, breaks narrow "necks" between particles and eliminates thin protrusions, as well as removing small features.

Prune

This function trims short thin lines by a selected number of cycles. Choosing "to end" will trim lines until triple points are reached. Any pixel that has only 1 neighboring pixel is removed with each cycle. This function only works after thinning. It is available for square and hexagon kernels. The user selects the number of cycles or to end.

Radial Grid

This function generates a circular grid using selected bitplane. Grid, radial dialog box allows user to type in number of circles and diameter lines to form the grid. The maximum grid is 100 circles and 100 diameters.

Seed

This function finds the single line or point at the center of an object. Sometimes objects like a dumbbell will have more than one seed point. This function is available with square and hexagon kernels.

Separate

This function automatically separates objects that touch each other. Separate algorithm looks for valleys or necks, which may connect adjacent objects.

Square Grid

This function generates an X by Y grid using selected bitplane. The frame option will put a border around the outside of the image or process frame. The maximum grid is 100 X 100.

Thicken

This function adds layers of pixels to the objects in the selected bitplane for the selected number of cycles. Unlike dilate, thicken will not connect objects that did not touch prior to applying the thicken function. You can select number of cycles or to end. To end dilates objects until 1 pixel is left between objects. Both square and hexagon kernels are available.

Thin

This function removes layers of pixels on the objects in the selected bitplane for the selected number of cycles. Unlike erode, thin will not remove objects but rather stops when the object is 1 pixel wide or reduced to a point. Square and hexagon kernels are available. The user can select the number of cycles or to end.

Trap

This function eliminates objects that completely fit inside a specified test box of X by Y size. Particles that do not fill the test box can be sent to either another bitplane or discarded (to none).

0 Degree Feret

This function is the measurement of the horizontal feret. The angle is measured relative to the positive X axis as seen on the monitor screen that is in horizontal position. The result is provided as a number in the chosen units of measurement.

45 Degree Feret

This function is the measurement of the diagonal feret. The angle between the feret and positive X-axis is 45 degrees. The result is provided as a number in the chosen units of measurement.

90 Degree Feret

This function is the measurement of the vertical feret. The angle between the feret and positive X-axis is 90 degrees. The result is provided as a number in the chosen units of measurement.

135 Degree Feret

This function is the measurement of the diagonal feret. The angle between the feret and positive X-axis is 135 degrees. The result is provided as a number in the chosen units of measurement.

Area

This function measures the area of each individual object feature in a particular bitplane. The result is provided as number in the chosen units of measurement.

Aspect Ratio

This function is the longest feret in a detected object divided by shortest feret in the same object. This is the same as Length/Width. The result is provided as a dimensionless number.

ASTM E-112 96

This function gives the ASTM grain size number as defined by ASTM specification E-112 96 for each individual grain. The result is provided as a dimensionless number.

Average Feret

This function is the average measurement of all the ferets of an object. The result is provided as a number in the chosen units of measurement.

Breadth

This function is also called Orthogonal feret that measures the feret perpendicular to the angle of the longest feret (length). The result is provided as a number in the chosen units of measurement.

Circular Diameter

This function determines the equivalent circular diameter of each individual object in a selected bitplane in the image. The area of the object is measured first, and then an equivalent circle with the same area is calculated. The diameter of this circle is the equivalent circular diameter of the object. The result is provided as a number in the chosen units of measurement.

Compactness

This function is defined as 4*pi * Area / (Convex perimeter^2). The result is provided as a dimensionless number.

Convex Perimeter

This function is an approximation of the perimeter of the particles that have concave edges. Convex perimeter is a rubber band around all ferets in a particle. The result is provided as a number in the chosen units of measurement.

Density

This function is also called "Photographic Density." This is the measurement of the average gray level values of all detected pixels in the detected bitplane in the image divided by 255. If the image is completely black, which means no light can come from it, the density of this image is 0%. If the image is completely white, which means all light can come from it, the density of this image is 100%.

Length

This function gives the longest measured feret. The result is provided as a number in the chosen units of measurement.

Orientation

This function gives the angle at which the longest feret occurs. This function is used to give an angle of the particle relative to the X-axis on the monitor screen. The result is provided in degrees.

Perimeter

It is the distance around each individual feature or object. It gives the perimeter for each particle. The result is provided as a number in the chosen units of measurement.

Roughness

This function gives the roughness for each object in the selected bitplane in a range of 0 to 1.0. Roughness is defined as the ratio of the convex perimeter, which is a rubber band around all feret, to the perimeter. If there is no concave at the edge of the particle, the roughness of this particle is 1.0. The result is provided as a dimensionless number.

Spherical Diameter

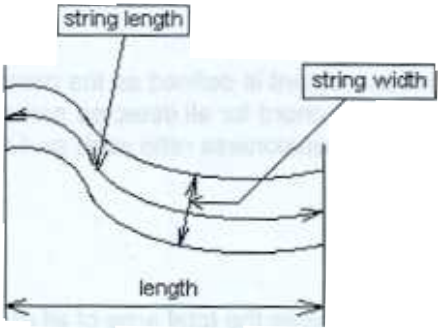
Spherical diameter is defined as the (circular diameter * 1.22474). This measurement gives the equivalent spherical diameter of each individual object in a bitplane in the image. The result is provided as a number in the chosen units of measurement.

Sphericity

This function measures the sphericity of each object in a selected bitplane in a range of 0 to 1.0. Sphericity is defined as (4 * PI * area) / (perimeter^2). If the shape of the particle is a perfect circle, the sphericity of this particle is 1. The more bumps a particle has, the lower sphericity value. The result is provided as a dimensionless number.

String Length

This function is used to measure the actual (curved) length of objects that are thin, curved and elongated. The result is provided as a number in the chosen units of measurement.



String Width

This function is used to measure the actual (curved) width of objects that are thin, curved and elongated. The result is provided as a number in the chosen units of measurement.

Width

Width is the shortest of the measured feret. It measures the minimum feret diameter of each particle in a selected bitplane. The result is provided as a number in the chosen units of measurement.

X Centroid

This function gives the Centroid X coordinate with respect to the origin of the image or Guard Frame (if used).

Y Centroid

This function gives the Centroid Y coordinate with respect to the origin of the image or Guard Frame (if used).

Anisotropy

This measurement is defined as the mean horizontal chord divided by the mean vertical chord for all detected particles in the selected bitplane. The result is a dimensionless ratio such as 1.6.

Area

This function gives the total area of all objects or phases of interest for a particular bitplane. The result is provided as a number in the chosen units of measurement.

Area Percent

This measurement is defined as the area of a particular bitplane divided by the area of the field being measured. The result is expressed as percentage such as 45.3%.

ASTM E-112 96

This measurement gives the average ASTM grain size of the metal microstructure using the average chord length as defined by ASTM specification E-112 96. The result is provided as a dimensionless number such as 10.69.

Average Area

This measurement is the area of all the particles in the selected bitplane divided by the total number of particles. It is the mean of feature area measurement. The result is expressed as a number in the chosen units of measurement.

Circular Diameter

This measurement gives the average equivalent circular diameter of all the objects in a bitplane of an image. The average area of each object in the field is measured first, and then an equivalent circle with the same area is determined. The diameter of this circle is the equivalent circular diameter of the object. The result is expressed as a number in the chosen units of measurement.

Count

This measurement gives the total number of objects in the selected bitplane within the measurement frame. The result is provided as a dimensionless number such as 67.

Note: Holes in particles must be filled before measurement or a miscount may occur.

Density

This function is also called "Photographic Density." This is the measurement of the average gray level values of all detected pixels in the detected bitplane in the image divided by 255. If the image is completely black, which means no light can come from it, the density of this image is 0%. If the image is completely white, which means all light can come from it, the density of this image is 100%.

Horizontal Intercept

This measurement gives the total number of horizontal intercepts of horizontal scan lines with the particles in the selected bitplane. The result is expressed as a dimensionless number such as 252.

Horizontal Mean Chord

This measurement determines the approximate width of the selected objects. It is defined as the total horizontal chord lengths divided by the total number of horizontal intercepts. The result is provided as a number in the chosen units of measurement.

Number/Area

This measurement is defined as the total number of objects divided by the total field area within the measuring frame. It determines the number of objects per unit area. When using this measurement, it is better to use large area units of measurement (i.e., millimeters or inches) rather than small units (i.e., microns). If small units are selected, values for this measurement, such as 0.0013 particles per unit area can be the result. The result is provided as a number in the chosen units of measurement.

Perimeter

This measurement determines the sum of the total individual object perimeters (length of the edges around an object) in a particular bitplane. The result is provided as a number in the chosen units of measurement.

Spherical Diameter

Spherical diameter is defined as the circular diameter, multiplied by 1.22474. This measurement gives the total equivalent spherical diameter of all the objects in a bitplane of an image. The result is provided as a

number in the chosen units of measurement.

Vertical Intercept

Vertical intercept gives the number of vertical intercepts of vertical lines with the particles in the selected bitplane. The result is expressed as a dimensionless number such as 577.

Vertical Mean Chord

This measurement determines the approximate height of the selected objects. It is defined as the total vertical chord lengths divided by the total number of vertical intercepts. The result is provided as a number in the chosen units of measurement.

Area Fraction Plane Measurement

This function measures the area percentage of a particular bitplane relative to the measurement of the total area of a reference bitplane. This function allows the selection of a specific bitplane as the reference for measuring the percentage. Although only 1 reference bitplane is chosen, as many source bitplanes as required may be selected. In other words, Area % = (source bitplane area)/(reference bitplane area) * 100%. Results are always reported as a percentage.

Area Fraction Sample Measurement

This function measures the area percentage of a particular bitplane relative to the measurement of total field area in the field of view or to the Guard Frame, whichever is smaller. In other words, Area % = (source bitplane area)/(Guard Frame area) * 100%. Results are always reported as a percentage.

Criteria Measurements

Criteria allows the user to set limits for any of the measured data. The user may set limits of less than, greater than, inside limits or outside limits. This may be undertaken for Field, Feature, Area fraction Plane, or Area fraction Sample. When Criteria Measurements are used, an Excel file called fieldmap.csv is generated with a data column for any criteria measure step. For Field and Area fraction Criteria the fieldmap.csv file will indicate 1 for fields exceeding the set limits. For Feature Criteria the fieldmap.csv file will show the number of features exceeding the set limits.